SMALL BUSINESS INNOVATION AND RESEARCH LEGISLATION

HEARING

BEFORE THE

SUBCOMMITTEE ON GENERAL OVERSIGHT

OF THE

COMMITTEE ON SMALL BUSINESS
HOUSE OF REPRESENTATIVES

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FIRST SESSION

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SMALL BUSINESS INNOVATION AND RESEARCH LEGISLATION

TUESDAY, SEPTEMBER 15, 1981

House of Representatives,
Subcommittee on General Oversight,
Committee on Small Business,
Washington, D.C.

The subcommittee met, pursuant to notice, at 11 a.m., in room 311, Cannon House Office Building, Hon. John J. LaFalce (chairman of the subcommittee) presiding.

OPENING STATEMENT OF CHAIRMAN LaFALCE

Mr. **LaFalce**. The Subcommittee on General Oversight of the Committee on Small Business will come to order.

Our subcommittee is holding hearings today on legislation to strengthen the role of small, technology-based firms in federally funded research and development programs and to actively promote innovation by these types of companies.

How to stimulate innovation is an issue of great concern. I have fashioned one approach in H.R. 4326, the Small Business Innovation Development Act of 1981, which I have introduced.

Three other bills—H.R. 3091, 4343, and 4373—that differ slightly, will be considered at this hearing.

All of the bills would require all Federal agencies having R. & D. budgets of over $100 million a year to establish small business innovation research programs and to set aside a certain percentage of funds for the SBIR program.

These programs would be modeled after the highly successful NSF program. In addition, all Federal agencies with R. & D. budgets of more than $20 million a year would be required to establish small business set-aside goals that would be higher each succeeding year than the preceding year.

Present law only encourages agencies to set higher small business set-aside goals each year. The main difference between the bills is the percentage of the set-aside for the SBIR programs and the phase-in percentage for the programs. Similar legislation is being considered in the Senate.

The small business sector could and should play a key part in our effort to overcome these problems. We have seen over the past three decades that small high-technology companies, free of the bureaucratic fetters and institutional inertia of larger enterprises, have been the generators of most pioneering innovations.

A recent Government report laying out small business' records cited four striking figures:

Firms with less than 1,000 employees accounted for almost one-half of the major U.S. innovations during 1953–73.

The ratio of innovations to sales is about one-third greater in firms with less than 1,000 employees than in firms of over 1,000 employees.

Firms of less than 1,000 employees have a ratio of innovations to R. & D. employment which is approximately four times greater compared to firms with more than 1,000 employees.

The cost per R. & D. scientist or engineer is almost twice as great in firms of over 1,000 employees than in firms with less than 1,000 employees.

Today, we have only to look at corporations such as Genetech Corp. and Apple Computer to see the pathfinding role played by these small companies and the possibilities for even greater innovation—and accompanying economic revitalization—if these types of firms are encouraged.

A study by Data Resources comparing the performance of high- and low-technology companies reached several conclusions that are worth reviewing as we begin consideration of the bills before us: High-technology industries grew nine times faster in employment, three times faster in output, two times faster in productivity, but only one-sixth as fast in rate of price increases as low-technology industries.

As important, the balance of trade in high-technology products increased to a surplus of $25 billion between 1950 and 1974, while low-technology products fell from break-even to a $16 billion deficit in the same period.

However, it has become increasingly difficult for these businesses, many of which are intrinsically fragile and risky, to make their way in these times of expensive research and high interest rates.

Under these conditions, the Federal Government has to step in and provide a helping hand if these firms are to continue making their important economic and scientific contributions.

The Federal Government is clearly in a position to help. The procurement and R. & D. policies of the Federal Government will either foster the growth of our Nation's small business and innovation or contribute substantially to the ossification of innovation and the decline of small business by promoting the trend toward giant corporate control of our economy and the Federal procurement system and R. & D. awards.

The small business sector is not asking for favors. It is merely requesting a fair opportunity to compete. However, as anyone familiar with our Federal procurement and R. & D. system can attest, the deck is heavily stacked.

The growing influence of the large corporate contractors and academic and research institutions has led to the Federal procurement system steadily and unmistakably moving in the direction of a pronounced bias in their favor.

The time has come for Congress to recognize its responsibility to foster the growth of this potential by requiring that a small share of the billions of dollars the Federal Government spends on R. & D. be used to encourage small businesses that generate new technologies.

The executive branch's failure to fully utilize the technological potential of small business is all too clear. The Federal Government procures over $30 billion in R. & D. annually, but less than 4 percent is from small business.

Of the over $15 billion procured from business, only 70 companies do 80 percent of this research, and only 4 companies account for nearly 20 percent.

Most of these, of course, are very large firms. These figures dramatize the extent to which small business is frozen out and ignored.

Because of the failure of Federal agencies to reach out on their own to small, high-technology firms, Congress must take the initiative. That's what we are doing here today.

The witnesses we will shortly hear from will present the case for action, review the dismal history of previous Government efforts to increase the use of small firms in Government-funded R. & D. work, and set forth the views of various Federal agencies and the small business and academic communities on the legislation.

At this time, I would like to introduce into the record an editorial by Milton D. Stewart, the former chief counsel for advocacy of the Small Business Administration, and now an officer of Inc. magazine.

It is titled "Congress Hears—and Forwards—a Message" and appears in the September 1981 issue of Inc. Mr. Stewart strongly endorses the concept of small business innovation bills.

[The Inc. magazine article follows:]

CONGRESS HEARS—AND FORWARDS—A MESSAGE

(By Milton D. Stewart)

Eighty-one United States senators have joined to sponsor (not just vote for) a "Small Business Innovation Research Act of 1981." We have previously reported at length on the urgency of swift and decisive federal action on this matter. Our country badly needs the forward thrust that this measure will give it. Expert testimony before the House Committee on Science and Technology (by Dr. Aron Gellman, president of a Harbridge House subsidiary) reports data showing that small firms (under 500 employees) produce 2.4 times as many innovations per employee as large ones.

In the fact of this and much other similar evidence, the federal bureaucracy continues to spend with small business less than 4 cents of every one of the 35 billion research and development dollars it controls every year. In the words of one respected federal research manager, this is nothing less than "cheating the taxpayer."

For two reasons, then, we have saluted the wisdom and responsibility of the 81 Senate sponsors of S. 881 on our new "Entrepreneurship Honor Roll." First, because of their specific step in moving together to meet an important national need. And second, because their action should be the first installment of an ongoing message to the career federal bureaucracy: Stop feeding the growth of government and government-sized business at the expense of entrepreneurial small and new business.

This is a clearly bipartisan group of senators—41 Republicans and 40 Democrats. It runs the whole political gamut—regional, ideologically, anyway you like. This is clearly a message from the whole country to the executive branch: It is time for a change. We've singled out for special mention Sen. Warren Rudman, a New Hampshire Republican who is the principal sponsor of S. 881, and Sen. Edward M. Kennedy (D-Mass.), who led the fight for the program in previous Congresses.

What S. 881 does is small in dollars, modest in scope, but large in significance. It directs each federal agency to develop a special research grant program for innovative small high-technology firms, using first a tiny two-tenths of one percent of its existing funds—no added cost to the taxpayer. That amount is raised to one percent. (House supporters are talking about raising it to two percent.) These funds are made available on an open competitive basis in two steps: initial grants of $30,000 for feasibility research in federally needed areas like productivity. There is then a second round of financing for some of the winners who have come up with the most promising results. And this is vital to us: Getting private business commitments for a third round to finance commercialization is one of the grounds for making second round awards. It has worked for the National Science Foundation—far more follow-on private money had turned up in support than the little federal seed-money used. This is, thus, a program with a built-in, leveraged kicker for the taxpayer. It provides an incentive for privately funded marketplace applications of federal research.

In our view, the longest-running Washington scandal is the impunity with which the federal bureaucracy has been allowed to take into camp administration after administration on this subject. Courageous, broad-gauge, and alert civil servants (and there are more than a few) are again disheartened by the dreary replaying of the old downtown Washington scenario: "We know best, all you newcomers. Here's a rewrite of the same memorandum we used to stop small business the last 10 times." And whether the administration is Republican or Democratic, it usually works. The pitch is varied slightly to accommodate the political lingo of the party in power, but the permanent bureaucratic doctrine rolls on without change.

Four arguments against S. 881, for example, are made in a variety of forms by agency witnesses and memo writers. It allegedly permits the use of government money for nongovernmental purposes. That's bunk, because the NSF model has made it plain that every federal dollar is used for a federally selected federal priority purpose. Commercial applications in the last phase must be financed privately. That's just what happens when, for example, an auto company learns how to do something making government tanks that it can use later on in making cars.

Then it's alleged that a percentage small business set-aside—even one as small as one percent—is an unwarranted "quota" that keeps the pious bureaucrat from choosing the "best" research performer. That's also bunk, because what the S. 881 set-aside really does is to discipline the bureaucracy which otherwise shovels all federal R & D funds into its three artificial and preferred "de facto quotas": government laboratories, nonprofit academic centers, and large companies. The competition that S. 881 sets up is far more vigorous and far more likely to produce outstanding performance in small-scale applied research than all those "de facto quota" beneficiaries rolled together.

Then there's the argument that in a time of budgetary stringency, even a one or two percent small business set-aside takes dollars that can't be spared away from needy and deserving nonprofit basic science research. That's bunk, because the present level of taxpayer financed based science research cannot be supported without a sharp increase in small-scale applications of that research. Otherwise we are simply doing more of what has gotten us into the soup for the past decade: giving our competitors around the world access to basic research which they apply, while we fail to do so.

Finally, and the biggest laugh of all, is the rouser that S. 881 is "unnecessary" because each agency itself can be trusted to do the best job possible for small business if left to its own devices. Exactly two federal agencies have formal and competitive programs of the kind S. 881 would mandate—the National Science Foundation and, just recently, the Department of Defense. Both have had to endure the most vicious and ceaseless internal opposition from the stand-pat brigade of the willfully blind.

What this bill does for research and development is what the country wants done across the board. The country often does not know how to say it affirmatively and clearly to the government so it shouts it negatively: "Stop using our money and your power to shrink the small business sector"—compared to growing bigness in government and large business. That's the message of S. 881 and it must be repeated in many other areas: taxes, regulations, capital, credit, interest rates, foreign trade procurement generally. We'll be talking about those in the months ahead.

For now, S. 881 represents a fine beginning. For those of you who are action-oriented, here are the next steps:

1. Three hundred House sponsors are needed promptly for a bill to parallel S. 881. A bipartisan group is forming behind Representatives Berkley Bedell (D-Iowa), Joe McDade (R-Pa.), Albert Gore (D-Tenn.), and Jerry Lewis (R-Calif.). If all the congressmen from the states represented by senators on Entrepreneurship Honor Roll No. 1 join in, that will be more than 400. We'll be glad to list them in Entrepreneurship Honor Roll No. 2.
2. The bill must pass both houses swiftly and with large enough margins to make the measure a sure bet for presidential approval.
3. The President must sign it into law.

4. Congress must keep a vigorous oversight watch on the bureaucratic foxes to protect the national small business R & D hen houses until that great new brood of industrial innovations is hatched.

Mr. LaFalce. With that, I wonder if any members of the panel have any brief statements that they would like to make?

Congressman Bedell.

OPENING STATEMENT OF HON. BERKLEY BEDELL, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF IOWA

Mr. Bedell. I have a short statement, Mr. Chairman.

Mr. Chairman, I wish to commend you for your initiative in holding this hearing on the important issue of innovation. And I wish to thank you for so generously allowing me this opportunity to sit as a member of your panel during today's proceedings.

Before we hear from today's witnesses, I think it would be useful to observe that this committee needs no convincing of the importance of small businesses. We are well aware of the fact that it is the small business sector of our economy that creates the new jobs in our society. We understand that half of all new American inventions come from small businesses. And we know of the recent Government studies that show that money invested in research and development efforts by small business yields many more innovations than we ever could hope to see from comparable expenditures at large corporations.

Instead of dwelling on these points, which I believe we all can accept as given facts, our attention today should focus on the questions of why some portions of the Federal bureaucracy seem to have such a hard time grasping these facts and what must we do to finally get the point across to those agencies. At a time when America's leadership position in technology is being seriously challenged and at a time when the Federal budget is contracting, we cannot afford to let Government agencies continue their wasteful practice of ignoring the research capabilities and potential of America's small business community.

Here in the House, several bills have been introduced, all requiring that the Federal agencies most involved in funding research must establish special programs to assure that small businesses will get an appropriate share of the research and development money.

You, Mr. Chairman, have introduced one such bill, as has Mr. Lewis. Mr. McDade and I introduced another bill, H.R. 4373, which now has 62 cosponsors. Similar legislation in the Senate has 82 cosponsors.

Last year, the White House Conference on Small Business ranked passage of small business innovation legislation as one of its top 10 recommendations.

The U.S. Chamber, the National Federation of Independent Business, the National Small Business Association, and many other organizations are on record in support of this concept. A very successful pilot program already exists at the National Science Foundation.

Mr. Chairman, the need for this sort of legislation is evident. There exists broad bipartisan support for action by the Congress. It is my hope that we can proceed as quickly as possible with consideration of this legislation.

Thank you.

Mr. LaFalce. Any others? Mr. Dreier, Mrs. Snowe, Mr. Lewis?

OPENING STATEMENT OF HON. JERRY LEWIS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF CALIFORNIA

Mr. Lewis. Thank you, Mr. Chairman. Mr. Chairman, let me echo my colleague's compliment to you and this committee for your willingness to consider this legislation today.

It is important, I think, for the record to endorse your own statement regarding this legislation and your effort in the subject area.

To me, it is obvious that we need this legislation, if you will just simply review the history of small business' impact upon innovation and creativity in expanding the dynamics behind our industrial base. It is time we reviewed that history, and have Congress take some actions in connection with the important role that small business should play in our industrial expansion.

These bills are designed really to look at three areas. First, each of the bills applies a rather small percentage of dollars available from Government for research and development and applies those dollars to businesses below 500 employees, and in some cases, 1,000 employees.

It has been suggested, Mr. Chairman, that there may be some resistance expressed today to this kind of set-aside of a small percentage of dollars that would be specified for small businesses.

I would suggest formally for the record, Mr. Chairman, that to outline a budget for research and development and send it to the Congress is one thing. To suggest further that in policy development the Congress should not exercise their policy authority to give some specific direction to such dollars once they are allocated, to say the least is to ignore entirely our responsibility as members of the policy body.

So simply before that testimony comes, for the record, I would like to express my concern about that kind of attitude. First of all, in the last several years, moneys put aside for small business research in the final analysis have averaged between 3 and, roughly 4 and 2 percent, the minimum being 2 percent.

These bills call for a set-aside that is much smaller than this percentage. The real point of the bills is that we want to guarantee some minimum dollar availability for such fundamental research because those of us who addressed ourselves to this question, recognized a tremendous fall-off of money generally available for small business research.

It seems to me that we would miss the point if we didn't recognize the importance of these bills centering upon language that is designed specifically to clean the red tape that has stood in the way of small business applying for those fundamental research dollars.

Very often, the very small business is discouraged because Government tends to want to create more paper in the way of progress than to take us directly to that progress. Therefore, these bills provide for a simple process whereby business will be attracted to funds that are already available within the pot that is the taxpayer dollar.

Beyond that, it is important to recognize that we are carefully emphasizing here, money being available to those highly technical companies that are doing basic research.

One of the questions that has been raised by my staff working with this legislation would cause me to caution the committee as they move forward. I believe that we should spend energy within our own staffs to evaluate just how rapidly we expand any requirement. Moving slowing with that percentage requirement is important, because very small companies could be, once again, discouraged if there is too much demand placed upon them as a result of the language of this legislation.

I feel very strongly that once the Congress moves forward and they have spoken, the administration will see the wisdom of this rather insignificant dollar volume effort to designate money for small business research.

I would very much like to commend the chairman for his effort on behalf of small business and the need for this fundamental research.

I just hope that we can move forward very quickly. I appreciate your allowing me to say a few words and appreciate your support.

Mr. LaFalce. Thank you very much, Mr. Lewis.

Mr. Addabbo has submitted an opening statement and we will introduce it now.

OPENING STATEMENT OF HON. JOSEPH P. ADDABBO, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Mr. Addabbo. Mr. Chairman, I have followed with interest the various small business innovation research proposals submitted by you and a number of our colleagues. As you might have expected, I wholeheartedly support the concept of creating a SBIR program in the large Federal research and development agencies.

Small businesses have been squeezed out of Federal research and development work, despite their record of accounting for one half of major U.S. innovations in the past two decades. It is thus not coincidental that America's record as a world innovator has been adversely affected by our foreign competitors.

I also see legislation necessary because we cannot depend on individual agencies to generate more small business research and research and development opportunities. Granted, the Department of Defense created its small business advanced technology program. However, the program has not been initiated at other agencies. In addition, small businesses are still at the mercy of arbitrary decisions by the administration to refuse to increase the percentage of R. & D. money to small businesses. As in other areas, we cannot depend on OMB to insure that this country maintains a strong small business base.

I look forward to hearing from our witnesses, who can help us determine how to rebuild this Nation's innovative capacity.

Mr. LaFalce. First, let me give everyone an idea of how we intend to proceed. We have quite a full plate. I intend to have Mr.

Glover, the small business panel, Mr. Swain and Dr. Prager testify what I would term this morning.

Then the agency panel consisting of basically representatives from the Government testify this afternoon, along with the representative from the Association of American Universities.

However, it is going to take a considerable period of time to complete what I refer to as this morning's grouping. Probably until 1 o'clock or 1:30.

It is my intention to go through until that time without breaking at 12 for lunch. And we will go until 1:30 if necessary, then have a half-hour break until 2 o'clock and then come back at 2 o'clock.

I would hope all the members could go along with that. At 12 o'clock, we will probably start having votes. It is my intention not to stop during voting but to ask at least one of the members to go over immediately to vote and then to come back immediately and chair so I could in turn vote, and we will just go nonstop.

I would ask all the witnesses to attempt to summarize your testimony. We will put the entire text of your remarks in the record. Attempt to summarize your testimony, in about 5 minutes or so. But we don't want to give short shrift to anybody. We want to make sure we get your full story.

While I offer that as a guideline, I don't mean to unduly restrict you. Those are the general guidelines under which we will be proceeding.

Any questions or comments on those? If not, let's proceed.

The first witness will be Mr. Jere Glover, former deputy chief counsel for Interagency Activities, Office of Advocacy, Small Business Administration.

As I said, Mr. Glover, we will introduce into the body of the record the entire text of your remarks. You may now proceed to summarize as you so desire.

TESTIMONY OF JERE W. GLOVER, ESQ., FORMER DEPUTY CHIEF COUNSEL FOR INTERAGENCY ACTIVITIES, OFFICE OF ADVOCACY, SMALL BUSINESS ADMINISTRATION

Mr. Glover. Thank you, Mr. Chairman, I appreciate the opportunity of appearing before you today. It seems sort of like deja vu. I have been here before, both as a staffer to a committee holding hearings on small business and innovation.

Then I have testified with Milt Stewart as a Government official concerning the area of small business and innovation in general and specifically concerning the small business innovative research program of the National Science Foundation.

Now, making the full circle, appearing as a private citizen on behalf of the National Council on Industrial Innovation as their general counsel.

In my capacity at SBA, I served on the President's domestic policy review as SBA's representative. I also served as staff to Milt Stewart's task force on small business and innovation, and as the Office of Advocacy Liaison with Congress on innovation acts.

The one thing in this variety of different roles that I have played during the past 4 years that becomes obvious is that without legislation mandating Government change in its R. & D. policy, it will not occur.

You will hear from Government witnesses who are saying basically the same thing that has been said before in the 1978 hearings and the 1968 hearings: "Trust me. I will do better. I have a better idea."

What we found when President Carter's science advisor came to testify in 1978 there was a growing commitment to small business, a deep dedication to an understanding of how important small business was.

We are going to hear from an official of the Science Advisor's Office for President Reagan. The one question I leave in your minds is, it's been 9 months. What new program has been put in that is going to do it better? We cannot wait forever. There have been studies, I will run through some of the studies quickly for you, and those studies have been studied.

At some point, this Congress is going to have to say, no more. The Charpie report in 1967 I mention from a historical point of view.

At that point, that report was considered the Bellweather report, the final report on the issue of innovation. The conclusion of that report, small business was the principal innovator, Government policy should be developed to make sure that small business fares better in the Federal procurement process.

Prof. Richard Morse summed up better than I could what happened between 1967 and 1977 when he testified before the Small Business Committees of the Senate and the House.

He said:

> No effective legislation or Executive action has resulted from the study other than to initiate endless other studies which often plow ground which has already been investigated.

Now, talking specifically about the area of research—of procurement, and I think that is what we are here for today, there were a lot of efforts.

President Carter's domestic policy review involved hundreds of private citizens. The conclusion that they came to, the one clear conclusion that virtually all of the groups came to, was that small business was the primary source of innovation and as such, special programs should be fostered.

Specifically, the National Science Foundation's SBIR program should be expanded governmentwide to all agencies with major R. & D. budgets, and the National Science Foundation's own program should be expanded.

When that presidential directive came out, I felt, now things are going to begin to change. A year later, when I was meeting with the Assistant Secretary of Commerce, Science and Technologies Council on Innovation, to hear Government officials from every agency, with the exception of Defense, act like the President had never said anything, amazed me.

The reason that the SBIR program is going to have to be mandated, if it is going to be enforced, is the institutional bias against it. That bias exists for several reasons, one of which, Federal officials don't like to be told what to do.

You are interfering with the prerogatives of the President, or perhaps one of his assistants, or perhaps one of his assistants'

assistants. Policy can be set by the Congress. In this case, there is no alternative.

We saw the past President issue a very clear directive to the Government agencies. One agency has gone forward with an additional program of $8 million. The National Science Foundation's budget for the SBIR program, which the President, in his memorandum had set at $13 to $15 million, was reduced first to $9 million, and then to $4.5 million. Virtually back to the level before the President's domestic policy review.

So I think given a wide variety of history, we have to look and see, why has the Government developed such a strong institutional bias against one small business in general, and, two, the small business innovative research program.

We have to understand two things, one of which is, small business does not have an effective lobby in Washington as far as the Government procurement operation is concerned.

There is no one small business which can afford to have the Washington staff to go visit with various procurement and technical officials and convince them that their particular program is the best.

I think one thing that we have to understand beyond the small business issue is the competitiveness of the Federal procurement process. Over one-half of the Federal procurement dollars is not advertised formally, and there is no chance to bid on it. It is noncompetitive, or "follows on" to existing contracts.

That is over $8 billion of the $15 billion contract money that is awarded. And when we are talking about a total Federal budget, we are talking about not just the $15 billion, but roughly $33 billion.

Of course, in-house operations, there is no competition. The agency decides how it is going to spend its money.

You also have grants, again the grant process is often not competitive. So the SBIR program has problems with the bureaucracy for two reasons. One, it favors small business and, two, it favors a competitive procurement process.

The SBIR program is extremely competitive, over 1,100 firms apply for the Department of Defense's SBIR program; 1,100.

Every time the National Science Foundation puts out a solicitation, there are literally hundreds of applicants for those awards. A purely competitive situation.

If we are talking about competition, we are talking about the free-market system. If the Government is going to award contracts, how better can they do it than a situation where you have hundreds of people competing for it?

When we talk about budget cuts and maximizing the limited funds the Government has available to it, how can you justify, how can anyone justify, spending money with firms and institutions that have a less effective rate of innovation?

If you are going to procure an innovation, you should buy it from the person who is most efficient. If we are talking about dollars, and saving dollars for the Government, small business, up to 25 times more efficient provider of innovation and technology, the Government should be spending all of its money for small business.

When we had the hearings in 1978, the late Chairman Breckinridge asked a question of the witnesses. If small business provides 50 percent of the innovations and does it up to 25 times more cheaply, why don't they receive at least 50 percent of the Federal R. & D. budget?

We got the answer, we will think about it and come back to you. Then we got the answer, we are going to try to do better.

Let me turn your attention to a table which is attached to my testimony entitled, "R. & D. Funding by Agency for Fiscal Years 1975 and 1980," and direct your attention specifically to the last column.

I think it is important that the committee and the Congress not get terribly concerned about specific numbers, because whether they are plus or minus 5 percent correct or not is not something the committee should waste a lot of time talking about.

These numbers have not been cleared with all the Government agencies, fortunately. When we have gone into the numbers, we have found in most cases that these numbers overstate the true small business share of them.

The 75 numbers are from the OMB 1977–78 paper. The rest of the numbers are derived from special tabulations from the Federal Procurement Data Center.

As you may know, all of the contracts now are coded and you can pull them out and find information. I think that it is important to understand that we still find, after 15 years of congressional hearings, 15 years of Government studies, and of presidential directives, that small business still receives less than 4 percent of the Federal R. & D. budget.

Somebody's not listening. I don't know any way to send a message to the bureaucracy besides legislation. They are not going to listen to anything else. We have been there before.

I think we have to mention one other aspect about the Federal procurement process. I have watched in the past 3 years several Government officials who have gone out on the limb and fought for small business programs, within the agencies, within the bureaucracy.

Two officials at the Department of Energy, we would call up and say, "Hey, what happened to those guys? They seemed to be on the ball. They seemed to be doing things." We get the same response: "Oh, they are no longer here. They have been moved out."

Same thing at the National Institutes of Health. "Oh, he's no longer here. He was going to leave anyhow."

You have a situation when somebody really tries hard to develop and push through a program, the bureaucracy finds him expendable for some reason. I think that we also have a situation where when budgets are cut, the easiest victim is the small business. We look at the Department of Energy's solar and conservation programs. When we were looking back 3 years ago and said, what have you done for small business? What are you doing for small business? They come forward with several programs. Today we find those programs have been zero-budgeted for 1982 and 1983.

What has replaced them? Nothing. It is very easy to eliminate small business programs. I think it is important that that discretion be removed from the Government officials, at least so far as the SBIR program is concerned.

Government officials don't like to take risks. You take a risk, you have a chance of losing. The SBIR program is so good because it says you don't have to take a risk.

If a technical person in an area chooses a small business and for some reason, the small business doesn't produce the good or service that he's requesting, he's under peer group pressure, his supervisor calls him in and asks him, why did he give that award to a small businessman, or that particular firm.

Didn't he know they couldn't do it?

Mr. LaFalce. I am afraid I am going to have to ask you to summarize your remarks in about a minute or so.

Mr. Glover. The SBIR program on risk taking is simple, it allows the person to give the money to the highest, to the best competitive solicitation, the best proposal.

As such, it removes that risk of the Federal employee being criticized by his peers. I think that without clear legislation, we are going to be right back where we have been, more studies, endless studies, and unfortunately, more Government officials coming up here lying to you, telling you they are going to do better.

[Mr. Glover's prepared statement and attachments follow:]

Prepared Statement of Jere W. Glover, Attorney at Law, Washington, D.C.

Mr. Chairman and members of the subcommittee, thank you for asking me to testify.

Today you are discussing an area dear to my heart—"Small Business and Innovation." During the past four years, I have been involved with the issue of small business and innovation in a variety of ways. My first involvement was as Counsel to Congressman John Breckinridge's Subcommittee on Antitrust, Consumers and Employment of the House Small Business Committee. I later went to work for Milt Stewart as his Deputy Chief Counsel for Interagency Activities. I served as SBA's representative on President Carter's Domestic Policy Review on Industrial Innovation and as staff to the Office of Advocacy's task force on small business and innovation. I was also advocacy liaison with the various Congressional committees concerning legislation, including S. 1860 and H.R. 5607, the innovation acts of 1980. On July 11, 1981, I left advocacy and entered the private practice of law. I also serve as General Counsel to the National Counsel on Industrial Innovation.

Throughout my involvement in this area, it has become obvious to me that without strict, specific legislative direction to the government agencies with research and development funds, small business will not receive a fair share of the innovation funding. I recognize that my position is contrary to that of most government agencies. Notwithstanding what any government official has said or says about their willingness to do it voluntarily, in my opinion it is imperative that there be specific, direct legislation requiring agencies to award a fair share of their procurement research and development awards to small business. The Federal Government finances 56 percent of all research and development activities in the U.S. How the government spends its R & D dollars is of critical importance to the future not only of small business but of this country. Let met ask the Committee to consider the question Congressman Breckinridge put to witnesses in the 1978 hearing:

"If small business accounts for over 50 percent of all innovations, and does it 24 times more efficiently, why doesn't small business receive at least 50 percent of the federal R & D dollars?"

Let me go through some of the history of innovation of small business and the government as I know it—some 25 years of unfulfilled promises. As I mentioned, my first involvement was in hearings conducted by the House Small Business Committee in joint session with the Senate Small Business Committee concerning underutilization of small business. During these hearings, the Small Business Committee called a number of government agencies to testify. Each official was asked what his agency had done, would do, and could do for small business. All we heard from the agencies was that the major issues were being "studied." Studies and more studies! Remember that several other congressional committees had held hearings on the issue of innovation during the late 1960s and early 1970s. In fact, as far back as 1967, an exhaustive report on innovation was issued by the Commerce Department. It detailed the importance of small business and innovation and made numerous recommendations. Nothing happened. Nine years later a blue ribbon task force of government employees was selected to review the issue and develop recommendations to increase innovation. This panel studied innovation in great detail. The solution to increasing innovation was obvious—help small businesses make innovations by giving them more R & D funds. Nothing happened. The OMB task force assigned to encourage utilization of small business in the R & D activities issued a report which was circulated to a number of government agencies.[1] According to this report, small business was the most efficient and productive supplier of research and development dollars, yet less than 4 percent of total R & D procurements went to small business. Still nothing happened. Professor Richard Morse summed up the government's actions toward small business from 1967 until 1977 better than I could:

"In 1967, as members of the Panel on Innovation and Inventions, several of us were involved with the preparation of a study for the Secretary of Commerce under the direction of Dr. Robert A. Charpie. This report[2] was widely disseminated both here and abroad. I have personally briefed at least three Secretaries of Commerce, members of the White House staff, a President's science adviser, and two Assistant Secretaries of Treasury on its contents. Dr. Charpie and others have had similar activities and testified at innumerable congressional hearings. . . . No effective U.S. legislative or executive action has resulted from this study other than to initiate endless other studies which often plow ground which has already been investigated. . . .

Turning to the joint Senate and House hearings on small business and innovation, it is important to note that in every government agency, officials explained that they could not understand why small business had not received a larger share of the R & D procurement and they all promised to do better. Let me recount for you some of the events that happened after these 1978 Congressional hearings. Remember that both Jordan Baruch, Assistant Secretary of Commerce for Science and Technology and Frank Press, the President's science adviser, testified that they would find out why small business wasn't doing better in the area of R & D awards and report back to the committee. During these hearings, both officials stated that they did not want to take any action until they had completed yet another exhaustive governmentwide and private industry investigation into the issue of innovation. So they launched into one of the most extensive and comprehensive reviews of government innovation ever conducted by the government. Dozens of business leaders from across the country were asked to serve on panels and to present their views on what was needed to be done to encourage industrial innovation in the United States. It's interesting that even after these hearings and statements on the importance of small business to innovation, no small businessmen were named to this industrial innovation group. Finally, after an inquiry was made from Congress as to why small business and even SBA had been excluded from the domestic policy review on innovation, SBA and several small businessmen were named. I was appointed as SBA's lead representative to the domestic policy review.

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[1] The OMB report (which I will refer to as the OMB March 10, 1977 Memorandum) was not issued finally until September 1978. When asked what happened to it, the comment was simply "It must have slipped through the cracks." Unfortunately, small businesses have been slipping through the cracks in the area of procurement, and especially R. & D. procurement, for some time. OMB did not issue this March 10th Memorandum for a year and a half because it was not that important to OMB. When it was finally issued, it was because the director of the Office of Federal Procurement Policy was requested to testify before the Small Business Committee and explain why it had not been issued. Miraculously, within five days of his receiving that letter, the memorandum was located and issued.

[2] The Office of Advocacy's role in the area of small business and innovation was extensive. Milton Stewart made innovation one of his top priorities. A task force of small business innovators was established under the Office of Advocacy's authority. After several days of intensive meetings, these individuals came up with a number of recommendations. The Office of Advocacy prepared a report of these recommendations, transmitted to the Congress, which printed this report. Subsequently, Chairman Neal Smith and Gaylord Nelson requested staff briefings on the recommendations of the task force and the Office of Advocacy assisted in drafting legislation in the Senate S. 1860 and in the House H.R. 5607. As you will perhaps remember, those bills were endorsed by the White House Conference and became one of the top fifteen recommendations at the conference.

Remembering Richard Morse's previous testimony, I went into the task with a commitment to try to make sure that this domestic policy review was different from previous government studies. I, along with almost a hundred government officials, began the task. After months of toiling in the vineyards of government policy procedures, the domestic policy review finally made its recommendations in March 1979. This was, if you remember, some *nine months* after the key government officials had promised to rush out the report to help small businesses. What came out of the domestic policy review was a October 31, 1979 memorandum from the president to the government agencies. Turning to that memorandum, I think it's important to note that one of the key recommendations was that the SBIR program currently being considered affect *all* federal agencies. The *one thing* everyone in the domestic policy review agreed on was that small business procurement and the SBIR program should be expanded. So here finally was a strong pronouncement for the President on the importance of small business in innovation and a strong directive regarding federal procurement.

Unfortunately, merely because the President directs something to be done does not insure that it will be done, as I soon found out. Some months later, when I inquired as to what agencies were doing in this regard, I observed puzzled glances. What program, what memorandum, what Presidential directive? For example, I was a representative at a government-wide meeting on the President's memorandum when I asked which agencies had implemented the President's directive and what its current status was. I was disappointed to find that with the exception of the Department of Defense, which was beginning to undertake such a program, no one single additional agency had taken any steps to implement the Presidential directive. The same agencies that had been "studying" the problem to death for 12 years, that had received blue ribbon reports telling them to improve the innovation process by involving more small businesses, that had been nudged by Congress in countless hearings, were now ignoring the President. But the story goes on.

As a result of that meeting, I was directed to prepare a memorandum for the Secretary of Commerce again transmitting the Presidential directive to all the government agencies and insisting on immediate implementation. I promptly prepared such a memo and submitted it to the SBA official responsible for transmitting it to the Secretary of Commerce and his assistants. I'm attaching a copy of this memorandum for the committee's review. You will notice it is marked "Draft". Unfortunately, this memorandum apparently was never transmitted nor was any other similar directive ever sent to the various government agencies reiterating the President's orders. So please forgive me if I sound a little jaded when I tell you that, quite frankly, you are never going to get any of these agencies off dead center without legislation.

The dozens of private citizens and government officials who spent their time on the domestic policy review, various study groups and on task forces have all wasted their time.[2]

Remember: Not only is small business being harmed by the government's continued failure to act, but so is the taxpayer. These short-sighted and wasteful government practices are depriving the economy of sorely-needed economic growth and squandering taxpayer's dollars. Small Business has been found to be 24 times more cost effective at innovating than large firms. Let me now show you why it is my opinion, based on four difficult frustrating years of attempting to improve the plight of small business, that there must be mandatory requirements to change the government's way of doing business.

I've attached a copy of a table to my testimony which shows the procurement awards of small businesses by agency in the most recent year available—1980. Compare the agencies' performance in 1980 with their performance in 1974 or 1975. In between we had the studies, the hearings, the Presidential directive.[3] Take a look at the numbers: Despite numerous hearings, promises by government officials, and even Presidential directives, nothing changed. Small business had a mere token of the R. & D. awards—less than four percent in 1975, and has the same mere token—less than four percent—today.

The record of the five administrations since 1967 shows nothing but stalling and willful neglect. This Congress must say once and for all no more meetings, no more task forces, no more domestic policy reviews, no more blue ribbon intergovernmental panels, no more discussion, no more promises and no more lies. There is now going to be a change in the law. Every appropriate agency must, at a bare minimum, establish an SBIR program.

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[3] The data in both instances was prepared by William Schirer. When Mr. Schirer prepared the original data it was for the 1977 OMB report. The 1980 data was prepared at my request before I felt the Office of Advocacy. Mr. Schirer has advised me that the data is roughly comparable.

R. & D. FUNDING BY AGENCY, FISCAL YEAR 1975 AND 1980

	R. & D. funding 1980	R. & D. contracts 1980	Small business percent of—		
			Contracts 1980	Contracts 1975	R. & D. funding 1980
Total all agencies	30,733	15,061	8.09	7.8	3.96
Defense	13,880	9,630	7.08	5.6	4.91
NASA	4,540	2,461	2.81	9.6	1.52
Energy	4,688	1,534	9.17	6.5	3.00
HHS	3,726	559	11.17	25.9	1.68
EPA	436	262	37.79	37.2	22.71
Interior	417	184	26.90	21.0	11.81
NSF	910	47	1.40	45.6	.07

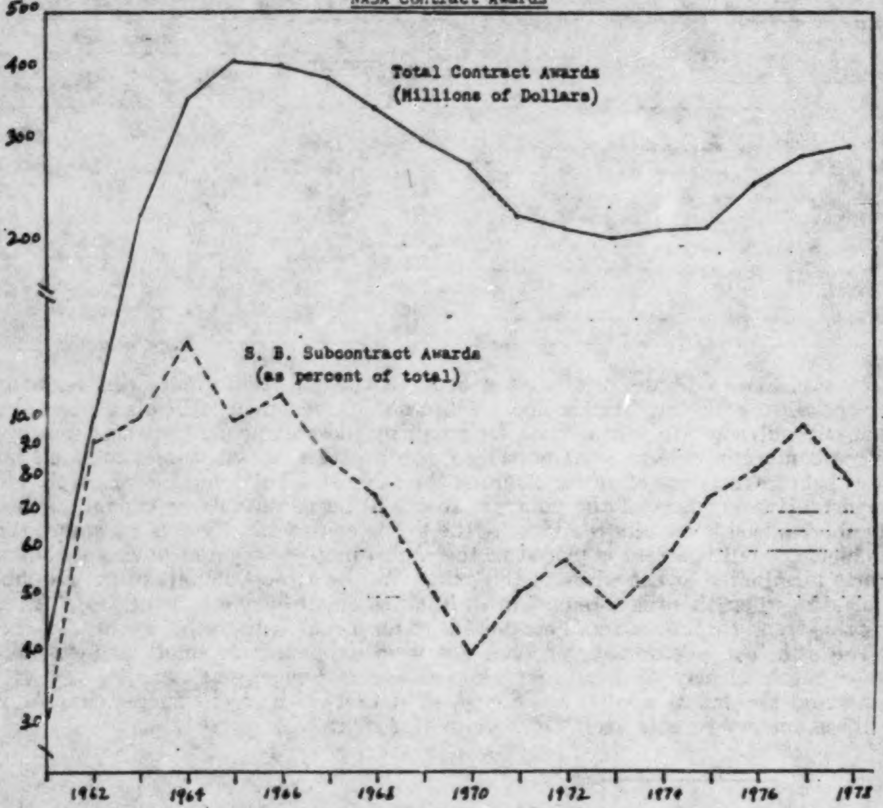
I would like to discuss briefly what Bruce Kirchhoff, the former Chief Economist for the SBA, calls the "trickle down whiplash." Government officials always argue that subcontracts are just as good for small business as prime contracts. Since the prime contractor selects what portion of the contract he will sublet to small business, subcontracts are often for cleaning the lab instead of doing the research. More importantly, any part of the contract that will be patentable or capable of being commercialized is usually retained by the prime contractor. Even if we ignore these problems, small business is placed in the unfortunate position of having its subcontracts terminated at the whim of the prime. As the attached chart of Dr. Kirchhoff indicates, when there is a reduction in funding, small business is the loser. Assuming this trend continues, small business is in for a real "whiplash."

The attached—a summary of what has been happening to small business—illustrates rather clearly what happens when an agency budget gets cut.

I would also mention what has happened at DOE with recent budget cuts. As you will see, history repeats itself. Dr. Kirchhoff is right.

FIGURE 5

Small Business Participation in NASA Contract Awards



Source: NASA Financial and Contractual Status (FACS) System

The bottom line of Federal energy R & D is that small businesses receive a disproportionately low share of Federal R & D funds and large firms receive a disproportionately high share of government support. Small business has demonstrated its unsurpassed record in innovation, especially in the area of energy. Yet, it appears that small firms continue to receive token amounts of funds. For example, in the area of solar energy, a prime opportunity for small firms, small businesses share of the DOE budget is no greater than 15 percent—approximately one fourth the amount awarded to large firms. In the past this poor record has sparked congressional hearings and the introduction of legislative amendments to require DOE small business set-asides of 20 percent. The proposed cutbacks in DOE's budget will most likely *reduce* rather than increase the shares of the monies directed to small firms. This is due to the fact that most R & D programs that are being retained or expanded, particularly synthetic fuels development and nuclear energy, are largely the domain of large companies. On the other hand, a handful of programs at DOE targeted to small firms are slated for significant cutbacks:

	1981	1982	1983
Appropriate technology grants program (millions)	$12.1		
Small business innovation research program	530,000		
Unsolicited proposal reserve program (millions)	1.250		
Office of energy-related inventions (millions)	5.8	$5.4	$4.9

In addition, the Department of Energy has announced the termination of a small but effective small business innovation program known as the Office of Advanced Technology Projects (OATP). OATP specialized in seeking out small projects involving high risk, high payback technologies in the energy area. Most of the projects funded by OATP were with small innovative firms, the very type of company that I believe will produce the major innovations to reduce our Nation's dependency on non-renewable fuels. What is so alarming is that DOE's new stated policy is to concentrate R & D on high risk, high payback projects. Yet DOE has eliminated a key small business program fulfilling this directive, while retaining gigantic multibillion dollar subsidies for big business in the synfuels and nuclear industries.

Mr. LaFalce. Thank you very much, Mr. Glover.

Mr. Bedell, any questions?

Mr. Bedell. We are short on time, but I am interested in how the Office of Advocacy is supposed to work. How did it work when you were there as compared to how it's working now and what is the job of the Office of Advocacy in small business as you understood it?

Mr. Glover. The role of the Office of Advocacy is to represent the views of small business before the Government, the public and the Congress.

Mr. Bedell. Were you there to represent the administration, or the Small Business Administration, or the small business society?

Mr. Glover. Hopefully we could do all three. When those situations arose where we could not do all three, the legislation appeared to clearly say we must represent small business.

Mr. Bedell. The White House held a conference on small business and they came out with 10 major recommendations. Did you feel it was your job to try to promote those recommendations or not?

Mr. Glover. Yes, sir, we did. I think our record speaks for itself of those, the majority of those 10 have become law in one form or another.

Mr. Bedell. Did the Carter administration support all 10?

Mr. Glover. No, sir.

Mr. Bedell. But you supported them whether the administration did or not, you are saying?

Mr. Glover. Yes, sir.

Mr. Bedell. In regard to studies that the Office of Advocacy commissioned, did you have studies made by special small business organizations, or special committees appointed to make studies of particular issues?

Mr. Glover. Yes, sir, we had task forces selected.

Mr. Bedell. Did those task forces come forth with recommendations while you were there?

Mr. Glover. Yes, sir.

Mr. Bedell. In all cases?

Mr. Glover. Yes, sir.

Mr. Bedell. Thank you.

Mr. LaFalce. Mr. Dreier.

Mr. Dreier. I have no questions.

Mr. LaFalce. Mrs. Snowe.

Mrs. Snowe. Thank you, Mr. Chairman.

Mr. Glover, as you mentioned in your testimony, there is obviously an inordinate amount of resistance on the part of the agencies to set aside some of this innovative money for small business. How do you think, first, I would like to ask why, if you could just enlighten the committee as to why there was such a resistance.

Second, how do you think, if at all, it will manifest itself if this legislation is passed?

Do you think it would spill over in any way even if this legislation is passed by the Congress?

Mr. Glover. Yes. The first part of it is risk-taking. If you don't do anything in Government, you cannot be punished for being wrong. So risk-taking, if you go out and do a new program that happens to succeed, well, it may fail.

If you do no new program, then you are insulated. So we are back to risk-taking.

Will the Government wholeheartedly support this legislation if it passes? The only thing I can say is I have found that laws have far greater impact than any other kind of message that Congress sends to the bureaucracy.

Every Government official swears to uphold the laws and Constitution of the United States. There is an oversight process by the Congress which will hold him accountable.

I think you will still have to do some oversight, because I think there will be some recalcitrants among the agencies but I think it will work.

Hopefully, the people take their oaths of office very seriously. I know I did.

Mrs. Snowe. Have you examined the various pieces of legislation that have been introduced on the subject in the Congress and do you have any suggested changes?

Do you think they are adequate? They all differ in terms of percentages, but overall, obviously have the same direction.

Mr. Glover. By and large, the legislation that has been presented, I think, is satisfactory and will do the job. All of the various bills are close enough with minor adjustments that they will be accomplishing the task.

Mrs. SNOWE. Thank you.

Mr. LAFALCE. Mr. Lewis.

Mr. LEWIS. Mr. Chairman, I just would like to react for a moment to the testimony. I was most intrigued with your comments about past administrations and this administration, all paying lip service to stimulating small business and using Government clout and dollars to provide opportunity where logic and risk would justify the lip service.

The pattern has not changed, regardless of Republican or Democrat. For years, it's been my own concern that too often policy is developed at the third level. And because of the world problems we deal with, a question like this is automatically taken at the word from the third level.

Let's not rock the boat or change the direction. To say the least, the provisions in these bills in terms of a percentage of set-aside compared to the 50-percent figure you mentioned are a small token at best.

I cannot believe that a new administration is going to end up advocating that such a small token somehow distorts administrative authority. It is just for the record once again, to repeat my own concern about that type attitude.

I would hope the committee would set that attitude aside as they move forward.

Mr. LAFALCE. Thank you, Mr. Lewis.

Mr. Glover, thank you very much for your testimony. I am aware of the fact that Representative Doug Walgren, who is chairman of the Subcommittee on Science, Research and Technology in the House of Representatives is here, desirous of testifying.

As a matter of congressional courtesy, we always permit Members of Congress to appear when they arrive.

Mr. WALGREN. Thank you very much, Mr. Chairman. I apologize for having other commitments that prevented me from being here when you started the hearing.

I don't know that these remarks merit interrupting any of the witnesses from the private sector, but I did have an important function to perform. That is, to reserve a place in the record for written remarks by the chairman of the full Science and Technology Committee, Congressman Fuqua. It is a privilege of mine to be able to perform that function. I hope his remarks will be made a part of the record.

Mr. LAFALCE. They certainly will, Congressman.

[Mr. Fuqua's prepared statement follows:]

PREPARED STATEMENT OF HON. DON FUQUA, CHAIRMAN, COMMITTEE ON SCIENCE AND TECHNOLOGY

Mr. Chairman, I appreciate the opportunity to submit testimony to your subcommittee as you initiate discussions on pending small business innovation research legislation. I want to commend Chairman LaFalce, along with Mr. Bedell and Mr. Lewis, as principal sponsors of most of the legislation under review. These bills bring needed attention to the role of small businesses in innovation—both from an historical and a future perspective. They highlight the remarkable contributions small businesses have made to our national productivity during the last 25 years, as well as provide a focus on the need for the Federal Government to cultivate the role of the small business sector in our economy.

I wish to endorse the remarks of the Hon. Doug Walgren, Chairman of the Subcommittee on Science, Research and Technology, who addressed your subcommittee in your proceedings.

I think that we must evaluate carefully the implications of any program which is designed to boost a particular sector of our economy, lest it be done at the expense of another. Chairman Walgren and I share a concern for the impact this legislation might have on academic research, and on our overall Federal research and development program, by requiring Federal R&D agencies with budgets over $100 million to set aside a certain percentage (1-3%) of their R&D budgets for SBIR programs.

A large portion of government R&D funds is committed in advance for continuing, large-scale projects—for instance, the space shuttle. The effect of the legislation may be to make funds allocated for basic research subject to a disproportionate share of the reductions which would necessarily have to be made to support SBIR programs. Furthermore, I am concerned whether the Congress can make this kind of funding commitment at a time when the Federal R&D budget—indeed, the entire Federal budget—is being severely curtailed.

Several of the bills you are considering exclude social science from the definitions of research or research and development which are used in the formula by which agencies will set aside a portion of their R&D budgets for SBIR programs. I believe this exclusion should not be made.

The Committee on Science and Technology has been actively involved in the innovation area and in efforts to identify inhibitors and catalysts to technological innovation. We are learning, for instance, that managerial competence is a key factor in the success of small, high-technology firms, and one that is equally important as capital availability and technical competence. While the human element may be less tangible than the other ingredients which contribute to an environment conducive to innovation, our greater understanding of the human factor may provide a critical link to our fuller comprehension of the innovation process. As a matter of interest, our Subcommittee on Science, Research and Technology has just completed six days of hearings on the "Human Factor in Innovation and Productivity". The tools by which we may expand our awareness of the human factor in innovation lie in the social sciences. I hope that the sponsors of the legislation will reconsider the exclusion of the social sciences from the bills' definition of research and development.

As a Member with a keen interest in our nation's small businesses and our Federal R&D enterprise, I look forward to the development of legislation which will be profitable to both. The Committee on Science and Technology has a deep interest in this legislation, and we look forward to working with you on it.

Thank you for providing me this opportunity to present my concerns.

OPENING STATEMENT OF HON. DOUG WALGREN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF PENNSYLVANIA

Mr. WALGREN. On my own, as chairman of the Science, Research, and Technology Subcommittee, I wanted to express my interest in small business innovation research and especially to commend both yourself, Mr. Chairman, and the committee, for holding these hearings and for introducing the several bills that are the subject of the hearings.

I think we all recognize that small business is perhaps the most essential part of the American economy which must function well if the economy as a whole is to provide the benefits that are also necessary for our society. To the degree that we improve the function of small business, we perhaps do more than any other kind of economic action can do. So we really want to play a part in focusing attention on the importance of that and what progress in this area might contribute.

As chairman of this Subcommittee on Science and Technology, we have jurisdiction over the National Science Foundation and have, therefore, tried to look closely at the National Science Foundation's small business innovation research program. I want to specifically recommend it to you.

I know that your bill is modeled after our experience in that area somewhat. Certainly, looking at that experience, there is great potential for the society as a whole. The small business innovation research program conducted by the National Science Foundation has shown very good success in its first period of time of operating. The program appears to my committee as being extremely well defined, and we take some pride in its initial successes.

I have several examples where small investment by the Government—in the range of $25 to $200,000—has concretely led to major investment on a scale of multiple millions of dollars by the private sector in projects and products which were fostered under that initial Government seed grant. It seems clear to us that the role of bringing these innovative products along to the point where they can then attract the venture capital that exists in the private sector is very important, particularly if it can be done with what are relatively small amounts of money, compared to the economic benefits that flow from the products when they are successful.

I do have one major concern for which there is no answer, but which I know that you will in your committee deliberations walk around and consider carefully from all sides. That is, whether or not the mandate of a fixed amount of money, even though small in percentages, is the right way to proceed. It is true that although we are talking about a small percentage in the two bills that have been introduced, when you measure that against the research budget as a whole, we are talking about an awful lot of money, something in the range of $800 million. That may not be that much money in some circles, but it is almost equal to the whole National Science Foundation budget as a whole. So it is truly a significant amount of money.

The question that I would like to underline for the committee is whether or not earmarking specific amounts of money like that will have perhaps unanticipated, but harmful effects. I think we have to consider that very carefully.

My concern is that since much of the research budget of the Government is conducted in relatively large products that may be amenable to participating in the small set-aside, that we will then focus the whole amount of the set-aside on a relatively small portion of the research and development budget. As we experienced with cutting a significant amount of money out of only the discretionary amount of the Federal budget, if we cut a significant amount of money out of only discretionary or limited range of the research budget, we might unintentionally put pressure on some programs that do deserve to be funded.

In particular, my concern is that academic research as a whole might be part of that more discretionary part, and that academic research might suffer. There is no answer to that. Clearly our experience is that we should be injecting money into this kind of an effort, and exactly how to do it, I would leave to the best judgment of the committee.

I appreciate the chance to come before you and express those thoughts.

Mr. **LaFalce**. Thank you very much, Congressman Walgren.

Just a few questions. The programs of the NSF, is that for basic research, or for applied research?

Mr. **Walgren.** It is my understanding that it is essentially applied. This is a small program, some $5 million, as I gather, in the last budget.

Mr. **LaFalce.** It is only the money for applied research that is then utilized under the SBIR program, correct?

Mr. **Walgren.** That is my understanding.

Mr. **LaFalce.** In the recent budget cutbacks, is it not true that an unbelievably higher percentage cut was made in applied research as opposed to basic research?

Mr. **Walgren.** You are absolutely right.

Mr. **LaFalce.** Do you have any data on that?

Mr. **Walgren.** I could submit some for the record. I think that is a very important point.

[The information follows:]

NSF SMALL BUSINESS INNOVATION RESEARCH PROGRAM

SIGNIFICANT RESULTS

Laser optics research was funded with OMEX, a small electronics firm in Santa Clara, Calif., for $25,000 for phase I in 1977 and $147,000 for phase II in 1978. The firm then received $5 million in phase III from the Heizer Corporation, a Chicago SBIC, for application of the research to a new field of electronic filing based upon the potential storage density. OMEX has since signed a $4 million contract to produce the equipment for the nation's largest title insurance company in Los Angeles.

Genetics research was supported in 1977 with Collaborative Research of Waltham, Mass., to enhance animal protein production. This was well before the Supreme Court decision and subsequent availability of venture capital. This was the company's first genetics research. NSF funding was $25,000 for phase I and $235,000 in phase II. Dow Chemical has since funded $7 million of continuing applications work and the company is currently negotiating a $10–$20 million private placement for up to 20 percent of the company with four large firms.

To increase productivity, NSF funded Advanced Mechanical Technology of Newton, Mass. for advanced research to implant an isotope on the cutting edge of machine tools for automatic production processes for $25,000 in phase I and $186,000 in phase II. GE, Ford, Chrysler and Raytheon were all interested as were the Japanese. Although no radiation problems are anticipated, the problem of obtaining the approval of the NRC, OSHA and EPA will take two years. Currently a fifth major U.S. industrial firm with plans for new partially automated factory is interested.

Research on measuring metal fracture toughness was funded with Terra Tek of Salt Lake City for $25,000 in phase I and $220,000 in phase II. The company has now built an instrument to measure the fracture toughness of drilling bits for mining and petroleum needs, now being sold world-wide. They are also working on other instruments to meet a wide range of applications in many different kinds of metals.

Soil and Land Use Technology, Inc. of Columbia, Md., received awards to determine the feasibility of introducing foreign food crops into the U.S. which were better adapted to environmental stress such as arid, wet or saline conditions. Their study has become widely known and they have recently received $130,000 from the American Newspaper Publishers Association to pursue kenaf, a hemp-like crop which grows in wet areas, as a possible source of newsprint.

Three earthquake engineering firms in the Los Angeles area that received grants in phase I formed ABK, a joint-venture, to conduct phase II using the unique capabilities of each firm. The study is probably the most comprehensive and best know to date in the important area of strengthening existing non-reinforced masonry buildings. The results are being implemented in Los Angeles building codes, studied by other cities and states, and professional organizations are using the study to suggest revisions to model building codes which will have world-wide application.

CURRENT STATUS OF NSF FISCAL YEAR 1982—AUTHORIZATION AND APPROPRIATION LEGISLATION

[Dollars in millions]

Research and related activities	Fiscal year 1982 revised request	Authorization			Appropriation			Fiscal year 1982 Carter request	Reagan reduction from Carter request
		H.R. 1520[1] House committee	S. 1200[2] Senate committee (Hatch)	S. 1194[3] Senate committee (Packwood)	H.R. 4034[4] House act	H.R. 4034[5] Senate act	Conference[8] recommendation		
Mathematical and physical sciences	$295.4	$295.4	$209.41	$290.41				$301.3	−$5.9
Engineering	102.5	102.6	100.56	100.56				104.6	−2.0
Biological, behavioral and social sciences	172.0	198.1	171.98	173.98		[9]$184.6	[9]$184.60	219.0	−47.0
Astronomical, atmospheric earth and ocean sciences	253.2	253.2	251.15	251.15				268.0	−14.8
Ocean drilling programs	26.0	14.0	24.00	26.00	(6)	(7)	(7)	30.0	−4.0
Antarctic research program	70.1	69.6	70.10	70.10				70.1	0
Scientific, technological and international affairs	37.7	56.4	35.70	39.70				80.0	−42.3
Cross-directorate programs	0	29.7	14.50	10.00				97.9	−97.9
Program development and management	63.2	63.2	62.20	62.20	$63.2	63.2	63.20	67.2	−4.0
Total, research and related activities	1,020.1	1,082.2	1,020.60	1,024.10	1,065.0	1,024.1	1,040.00	1,238.1	−218.0
Science and engineering education	9.9	75.0	20.40	19.90	35.0	19.9	27.45	111.9	−102.0
Special foreign currency	3.5	3.5	3.50	3.50	3.5	3.5	3.50	3.5	0
Grand total, NSF	1,033.5	1,160.7	1,044.50	1,047.50	1,103.5	1,047.5	1,070.95	1,353.5	−320

[1] Reported out by the Science and Technology Committee on May 13. No further action scheduled.

[2] Reported out by the Labor and Human Resources Committee on June 3d. Further action delayed pending resolution of jurisdiction over NSF by the committee or the Commerce, Science and Transportation Committee.

[3] Reported out by the Commerce, Science and Transportation Committee. Further action delayed pending resolution of the jurisdiction dispute with the Labor and Human Resources Committee.

[4] Passed by the House July 21.

[5] Passed by the Senate July 30.

[6] Distribution not specified.

[7] Amounts specified only for BBS and P.D. & M.

[8] Agreed to by conference September 10.

[9] Not more than.

Mr. LaFalce. I am wondering, if the will is there, won't a way be found to gut a program unless there is a statutory mandate that it cannot be gutted?

Mr. Walgren. I think that is the dilemma that we face.

Mr. LaFalce. Any further questions by members of the subcommittee?

Mr. Bedell. Mr. Chairman, I would simply like to thank our colleague for being here. He so clearly pointed out that the NSF program has set an example for the rest of the Federal Government to follow.

I must say that I share Mr. Lewis' feelings that when we are talking about such a terribly small percentage, I have great difficulty being concerned about the effect on other areas of our research. If we are talking about 50 percent or 30 percent, Doug, I would understand the issue that you raised. But we are only talking about 1, 2, or 3 percent. It appears to me all we are doing is sending a message that small businesses which contribute half of our innovation should have some small percentage of the effort.

Mr. LaFalce. Thank you very much.

[Mr. Walgren's prepared statement follows:]

PREPARED STATEMENT OF HON. DOUG WALGREN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF PENNSYLVANIA

Mr. Chairman, it is a pleasure to be here this morning to address the Subcommittee on General Oversight in these hearings on Small Business Innovation Research. Small businesses have been extremely innovative in the United States and I am sure they will continue to be in the forefront. It is very appropriate that you should be considering ways to stimulate small business in the area of technological innovation. I would like to commend Chairman LaFalce, for holding these hearings and, particularly, for his initiative in introducing the Small Business Innovation Research Act of 1981, H.R. 4254, and the Small Business Innovation Development Act of 1981, H.R. 4326.

These two bills and several other bills introduced in the House regarding small business innovation research all act to institute programs in many Federal agencies similar to the National Science Foundation's Small Business Innovation Research Program. The Science, Research and Technology Subcommittee, which I chair, has jurisdiction over NSF and has kept close track of the Small Business Innovation Research Program (SBIR) over the last four years. It is a well designed program and has been successful. It takes ideas from first conception into production. At the earliest stages of an invention, venture capital firms are unwilling to invest because they are not well prepared to judge the technological merit of the idea. By having technological experts evaluate the idea, a sound judgment of technological merits can be made at the earliest stages. Then by tieing the ideas to private capital in the following phases the program tries to insure that a sound innovation will actually get into production. The NSF program is a good model for use by other agencies and I am glad to see that the bills under consideration follow that model.

I do have one concern about the bills that I hope you will address in these hearings and in any legislative action that may follow. That is that the bills mandate a set aside in the Federal R&D budget. H.R. 4326, for example, has a set aside of 2 percent of the R&D budget of large agencies. Since the R&D budget of the entire Federal Government is about $40 billion annually, the set aside would amount to about $800 million each year. This is nearly as large as the entire NSF budget. We should weigh the concern that setting aside such a large amount of money is likely to have unanticipated harmful effects, in addition to the anticipated benefits. I would urge the Committee to consider other ways of funding small business innovation programs than the set aside method. One harmful effect could be an adverse impact on academic research. Because much of the Federal R&D budget is for very large projects such as the space shuttle which cannot readily be opened to small business programs, other parts of the budget, in particular the support of academic research, are likely to be disproportionately cut in order to allow for, in essence, affirmative action funding of small business innovation programs. Academic research is having a hard time under the current budget stringency, and no one wants to see further cuts. I urge you to take these concerns into account in any action on the bills you have under consideration. I know the Chairman of the full Science and Technology Committee, the Honorable Don Fuqua, was unable to appear himself at these hearings although he would have liked to. With your permission, Chairman Fuqua would like to submit written testimony for the record.

That completes the remarks I wanted to make today, Mr. Chairman. Thank you very much for the opportunity to appear before you. Small businesses have contributed tremendously to the United States economy through their innovativeness. The legislation you are considering today represents a promising approach to fostering future innovation by small business.

Mr. LAFALCE. The subcommittee will now hear from the Small Business Panel. That will consist of Dr. Harry G. Pars, Mr. John Motley, Mr. Herbert Spira, Mr. Samuel Cardon, and Mr. John Eastin. I would ask you all to come to the table at the same time, gentlemen.

PANEL CONSISTING OF HARRY G. PARS; JOHN MOTLEY; HERBERT L. SPIRA; SAMUEL CARDON; AND JOHN A. EASTIN

Mr. LAFALCE. At this time, I would like to introduce into the text of the record the full text of all remarks prepared by the five gentlemen at the table. However, I also, when I call upon them to summarize their remarks, I make the observation that often when I am asked to summarize remarks that I have prepared, my summary is sometimes longer than my prepared remarks. If you gentlemen believe that might be the case with you, if you might have the same difficulty that I sometimes have, I would prefer you read your remarks then. I think we have made the point.

Dr. Pars.

TESTIMONY OF HARRY G. PARS, SISA, INC., MEMBER, SMALLER BUSINESS ASSOCIATION OF NEW ENGLAND, INC., AND CHAIRMAN, NATIONAL COUNCIL FOR INDUSTRIAL INNOVATION

Dr. **Pars.** Thank you, Mr. Chairman.

I think there has been enough evidence already introduced today to indicate to all concerned that there are studies going back some 15 years that overwhelmingly outline the position of what some people have called the other economy and its contribution to the U.S. economy. That is today, the evidence that small, high technology companies play not just a major role, but perhaps the major role in stimulating development of new enterprise in this country, based on innovation and new products, and the jobs that result from that kind of activity.

For the record I will very briefly cite some of the statistics that have already been referred to in these studies. We all know of the Charpie report. That was a 1967 report of a distinguished panel, from the Department of Commerce. It concluded that small high technology based companies are responsible for a remarkably high percentage of innovations and inventions in this century, a much larger percentage than their relative investment in R. & D. would suggest.

I won't go through my testimony because it has been detailed before. I say at this point, almost ad nauseam. Mr. Glover referred to the fact we have had just about enough studies. What we now need is some action.

The NSF put out a study in 1976, in "Science Indicators." "Data Resources" has already been referred to by the chairman here today. The U.S. Office of Federal Procurement Policy, Office of Management and Budget in 1977.

A very distinguished study from MIT Development Foundation, a study on the role of new enterprises already referred to by Mr. Glover, and authored by John Flander and Richard Morris. The MIT study on the "Job Generating Process", by David Birch, a distinguished professor at MIT, in 1979.

All of these studies indicate that this other economy, small business high technology, these risk taking entrepreneurs, is really where the economy in this country has always gotten a boost in new product ideas and real growth. These facts are not new. They are not even debatable. That is, the creation of new jobs and enterprises in the U.S. economy traditionally has come from entrepreneurial inventors, innovators, and risk takers.

What is new and what is now exciting—to those of us in the small business community—is the prospect that Congress is about to put together, a pioneering partnership between industry and Government.

I want to tell you it is very difficult to get small businessmen to agree on any one thing, but there is overwhelming support for the concept behind the Small Business Innovation Research Act of 1981. I would also like to tell you that I represent the Small Business Association of New England at these hearings, Small Business United, and I am chairman of the National Council for Industrial Innovation, a coalition of high technology associates.

We are fully in support of this bill. It is not an ordinary program, nor is it in fact an experiment. It has already been carried out on a pilot scale by the National Science Foundation under the able leadership of Dr. Tibbitts, and it has produced results. I, and my colleagues, strongly support the bill and we commend you, Mr. Chairman, for holding these hearings to point out the need for it.

Thank you very much.

Mr. **LaFalce**. Thank you very much, Dr. Pars.

[Dr. Pars' prepared statement follows:]

PREPARED STATEMENT OF DR. HARRY G. PARS, CHAIRMAN, CHIEF EXECUTIVE OFFICER, SISA, INC., CHAIRMAN, NATIONAL COUNCIL FOR INDUSTRIAL INNOVATION

Mr. Chairman, and members of the subcommittee: Evidence that small high technology companies play a major role in stimulating the U.S. economy is overwhelming. For the record, I cite some of the statistics from government, university and industry over the past fifteen years documenting this fact:

In a U.S. Department of Commerce Study, "Technological Innovation: Its Environment and Management" (Charpie Report), 1967, the Secretary of Commerce convened a distinguished panel under Robert Charpie to consider the main factors affecting invention and innovation. In analyzing many studies they found that independent inventors and small technology based companies are responsible for a remarkable percentage of the important inventions and innovations of this century, a much larger percentage than their relative investment in R. & D. would suggest. These include:

The Jewkes study on 61 important inventions and innovations in this century, over one-half came from small firms and independent inventors; the Hamberg study (U. of Maryland) of the 1946–1955 decade found that over two-thirds of the major inventions resulted from the work of independent inventors and small companies; Professor Hamberg also studied 13 major innovations in the American steel industry. Four came from European companies, seven from independent inventors, none by American steel companies.

A National Science Foundation, "Science Indicators 1976", National Science Board, 1977 study stated that on the basis of a sample of major innovations introduced to the market between 1953–1973, small firms (with up to 1000 employees) were found to produce about 24 times as many major innovations per R. & D. dollars as large firms (over 10,000 employees) and 4 times as many as medium-sized firms.

In a Data Resources study for General Electric entitled, "The Role of High Technology Industries in Economic Growth" 1977, they compared the performance of high technology versus low technology industries in the U.S. over the 25 year period 1950–1974. The study came to the following conclusions: Employment in high technology industries grew almost nine times as fast as in low technology industries during this period; output grew almost three times as fast; productivity increased twofold over low technology; prices increased at only one-sixth the rate; and our balance of trade in high technology products rose to a surplus of $25 billion a year while in low technology products it declined from break-even in 1950 to a $16 billion deficit in 1974.

A U.S. Office of Federal Procurement Policy, Office of Management and Budget report "Small Firms and Federal R. & D." 1977, stated that small firms have compiled a striking record of innovation in the private sector. Firms with less than 1000 employees accounted for almost one-half of major U.S. innovations during the period 1953–1973; the ratio of innovations to R. & D. employment is four times greater in firms with less than 1000 employees than in larger firms; the total cost per R. & D. scientist or engineer is almost twice as great in firms of over 1000 employees than in smaller firms; in spite of the above record in innovation and lower cost, small business receives only 3.5 percent of total Federal R. & D.

An MIT Development Foundation Study, "The Role of New Technical Enterprise in the U.S. Economy" by John O. Flender and Richard S. Morse, 1975, showed the following: Young technology companies with sales equaling only two percent of those of the mature industry leaders created 34,369 new jobs or 34 percent more than the 25,558 new jobs created by the mature companies; the younger innovative companies with ending sales amounting to only 58 percent of those of the mature companies created 106,598 new jobs, or over four times as many as the mature firms; total employment in the mature firms increases at only 3.2 percent over the five years compared to 23.7 percent for the innnovative companies; and the innovative companies provided nearly $2.3 billion of income tax revenues compared to $1.5 billion for the mature companies, or 34 percent more taxes.

A Canadian Federation of Independent Businesses Study also shows that small businesses with 20 or less employees created 72 percent of all new jobs in Canada between 1969–1977. During this same period in manufacturing these small firms created 317,000 jobs while those with more than 20 employees showed a loss of 124,000 jobs.

Finally, the MIT Study for the Department of Commerce on "The Job Generating Process" by David L. Birch, February 1979, indicates that small concerns with 20 or fewer employees created 66 percent of all net new jobs in the private sector between 1969–1976. In addition 80 percent of new jobs came from businesses less than five years old. The same study showed that 87 percent of all net new jobs were created by firms with 500 or less employees. The study is based a upon a sample of 5.6 million businesses.

The above facts are not new. They are not even debatable. It is clear that the creation of new jobs and enterprises in the U.S. economy has traditionally come from entrepreneurial inventors, innovators and risk takers in the small business community.

What is new and exciting for the country is the prospect of forging a pioneering partnership between government and technology-oriented businessmen for the purpose of stimulating this other economy and specifically encouraging these entrepreneurs to convert their basic science ideas into tomorrow's jobs, today.

The Small Business Innovation Research Act of 1981 is not an ordinary program, nor is it an experiment. It has been carried out on a pilot scale by the National Science Foundation under the able leadership of Dr. Roland Tibbetts and, it has produced results.

For these reasons I strongly support the passage of this landmark legislation.

Mr. LaFalce. We will next hear from the distinguished representative from the National Federation of Independent Business, Mr. John Motley.

TESTIMONY OF JOHN MOTLEY, DEPUTY DIRECTOR, NATIONAL FEDERATION OF INDEPENDENT BUSINESS

Mr. Motley. Thank you, Mr. Chairman.

On behalf of our 500,000 member firms, I want to thank you and the other members of the subcommittee for inviting us to submit testimony on the creation of a small business innovation research program.

I will make my statement very brief and start it out by saying that NFIB strongly supports the establishment of the type of innovation research program proposed in the bills now before your subcommittee. We believe the program is needed for three specific reasons:

No. 1, it will send a clear signal to the agencies of the Federal Government that small business has a very significant and distinct role to play in the innovation process.

No. 2, it will set up a formal mechanism to get small businesses involved in this process.

No. 3, it can only help to remove some of the barriers that have been erected over the years to keep smaller firms out of this process.

I have only one concern, which is expressed in the conclusion of my statement. That is, the agencies that set up this small business innovation program do not use it as a mechanism or means to diminish or undermine the present competitive or sole source R. & D. awards that they are making to smaller firms.

NFIB strongly recommends that in whatever bill the subcommittee reports, that you retain language which prohibits any agency from setting up a program that would reduce the small business awards given in its previous year.

That concludes my remarks, Mr. Chairman, and I would be happy to answer any questions you might have and to give the subcommittee and full committee any help it might need in moving this legislation forward.

Thank you.

[Mr. Motley's prepared statement follows:]

PREPARED STATEMENT OF JOHN J. MOTLEY III, DEPUTY DIRECTOR OF FEDERAL LEGISLATION, NATIONAL FEDERATION OF INDEPENDENT BUSINESS

Mr. Chairman, the National Federation of Independent Business (NFIB), which represents in excess of half a million small and independent businesses across the nation, welcomes the opportunity to comment on a program which promises to be of significant benefit both to the small business community and to our nation as a whole—the Small Business Innovation Research Program.

Innovation is major factor in our country's long-term economic growth. Innovation creates new products, processes, and services that fuel productivity increases, resulting in significant increases in wealth per capita and higher quality of life for our citizens. Equally important, innovation creates jobs and stems inflation.

The results of numerous studies indicate that no other sector of the economy has made more contributions to technological innovation than small business. For example, a study of major innovations between 1953–1973, produced by the National Science Foundation and published in "Science Indicators 1976," found that:

Small firms produced about 24 times as many major innovations are large firms and almost four times as many as medium-sized firms per R&D dollar expended.

Small firms had a ratio of innovations to R&D employment four times greater than large firms.

The total number of major innovations by small firms was greater than by large or medium-sized firms.

The total cost per scientist and engineer was almost twice as great in firms of over 1,000 employees as it was in firms of less than 1,000 employees.

Small businesses tremendous innovative abilities are all the more extraordinary, given that these firms receive less than 4.1% of the Federal Government's total R&D budget and only 8.1% of the R&D contract awards. When we consider the significant contributions to technological innovation made by small firms with virtually no government support, imagine what benefits could be derived if government resources were channeled to the one sector of the economy with the proven ability to use such resources both efficiently and effectively.

Enactment of the Small Business Innovation Research Act of 1981 would accomplish three things. First, a clear signal would be given to Federal departments and agencies of Congress' recognition that small business has an essential role to play in technological innovation. Second, the Act would establish a formal mechanism—the Small Business Innovation Research program—to support the R&D efforts of small firms. Finally, a formal program such as the SBIR would not only promote the efficient allocation of resources on the part of the Federal Government; it would eliminate many of the barriers to small business participation that exist in the present procurement system.

Having made the final point, NFIB hastens to add that, in supporting the creation of a Small Business Innovation Research program, we in no way intend our support of this legislation to downplay the importance of continuing the effort to increase small business' share of R&D contract awards through the competitive bidding process. Our concerns and desires here seem to be shared by the Congressional sponsors of the Small Business Innovation Research Act, who have not overlooked the potential problem of agencies accepting to the creation of the SBIR program at the expense of R&D contracts presently being awarded competitively to small firms. For this reason, we would urge that the final language of the bill retain the express prohibition regarding competitive awards goals found in Section 4(h) of S. 881 that "no goal established under this subsection shall be less in actual dollars than the amount of research or research and development awards made to small businesses in 1981." We would also urge that specific language be retained in the final bill to insure that whatever portion of the R&D budget of any Federal department or agency that is awarded to a small firm by competitive or single source selection *not* be counted as part of the mandated percentage requirements for the SBIR program.

Mr. Chairman, NFIB wholeheartedly supports the concept of the Small Business Innovation Research program as an effective way to bring together, at no additional expense, resources of the Federal Government and the talents of small innovative firms for the benefit of the nation.

Mr. **LaFalce**. Thank you very much for your succinct and cogent remarks, Mr. Motley.

Now, Mr. Herbert Spira, National Small Business Association.

TESTIMONY OF HERBERT L. SPIRA, NATIONAL SMALL BUSINESS ASSOCIATION

Mr. **Spira**. Thank you Mr. Chairman, Mr. Bedell, Mr. Dreier, Mr. Lewis and other members of the subcommittee and staff.

We commend the subcommittee for its initiatives in holding these hearings, in preparing and introducing the legislation, and for their presence here this morning as an indication of an interest in this vital subject.

For those of you who are not fully familiar with us, we are an organization of 74 national trade associations representing 4 million businesses nationwide.

Mr. **LaFalce**. The Small Business Council thought that the Ways and Means Committee tax bill favored small businesses more so than the administration's, is that right?

Mr. **Spira**. That is correct.

Mr. **LaFalce**. Now I know the difference.

Mr. **Spira**. This council does include—and I say this for a specific reason—both heavy industry, such as metal stamping people and precision tooling, and light industry and commerce, such as wholesale distribution trades, retailers like the Menswear Retailers, the builders—100,000 home builders—700,000 realtors, service industries such as the National Retail Drug Association—our present SBLC chairman, Bill Woods, is chairman of that national organization.

The Small Business Legislative Council supports this legislation. However, we do have a couple of specific concerns about the technical aspects of it and some very deep concerns about the policy implications of it.

On a technical level, we find that the Senate counterpart of the bill and a couple of House bills, speak in terms of a requirement that the dollar amount of small business research, overall, be increased. In those areas which are essential to the national welfare, such as new and renewable energy resources, where research budgets are likely to be increasing quite rapidly, a dollar amount could quite likely result in a percentage decrease.

We would think the standard in Mr. Bedell's bill, of a percentage increase, would be a preferable standard. We reached this conclusion after talking with several organizations and business owners who are active in the research area.

This leads to our second point, the percentage of overall small business research procurement. We would like to see the legislation drafted in a way that makes clear that the SBIR program—which is an excellent program coupling the best in the public sector with the best in the private sector—not be substituted for present small business R. & D. procurement.

In the joint hearings in which members of this subcommittee participated in 1978, the report referred to by Mr. Glover, of the Office of Management and Budget on Small Business Research, was released. At that time, the small business share of Federal R. & D. funds was 3.4 percent. At that time, OFPP stated: "Federal Government contracting for R. & D. is one area in which small firms are inadequately used."

Now, according to the figures developed by this subcommittee staff, the small business share of Federal R. & D. funds is not 3.4 percent, but 2.3 percent in 1979. Unless that figure has increased dramatically, it means that for every 1 percentage point that that drops, it is a $300 million reduction in the amount of R. & D. funds going to small business. We don't believe the small business community or small business committees of Congress should ratify that decline.

On the contrary, the evidence of record before the Small Business Committee of the House shows that the agencies that show a concern with small business—NASA, National Science Foundation and to some extent, the Defense Department—have lived comfortably with mandatory standards for increasing the small business share of Federal R. & D. procurement.

NASA testified that they got more for their money. Their mission capabilities were enhanced by increasing the share of small business R. & D. procurement to 10 percent.

The National Science Foundation applied research program lived comfortably with a 12½-percent share.

The Small Business Legislative Council—and this is my final point, Mr. Chairman—actively supports increases of the small business share of R. & D. to 25 percent, which would match the percentage of general procurement going to small business.

We have 43 national associations who are actively supporting that position. We will support you actively when it comes to the bottom line, getting the best deal for small business that is possible for you to negotiate in this legislation.

We have not taken a position on how far the SBIR program should go, or how fast it should be phased in. We would like to hear the testimony. We are at your service in the later development of this legislation. We have a certified expert—Eric Schellin, former chairman of our board, who is a lifelong patent attorney, who would be glad to assist you, and other resources with which we may be able to help.

Mr. LAFALCE. Thank you very much, Mr. Spira, for your excellent testimony and we are also grateful for your offer of assistance as we proceed in the development of the legislation. We certainly will take advantage of that offer, thank you.

[Mr. Spira's prepared statement follows:]

PREPARED STATEMENT OF HERBERT L. SPIRA, ON BEHALF OF SMALL BUSINESS LEGISLATIVE COUNCIL

"It is the declared policy of the Congress that the Government should aid, counsel, assist, and protect, insofar as is possible, the interests of small business concerns in order to preserve free competitive enterprise. . . ." (P.L. 85-536, as amended, Section 2(a), Small Business Act.)

Mr. Chairman: We appreciate the opportunity to appear before this Subcommittee to comment on innovation and research bills presently before you for action.

The Small Business Legislative Council is a coalition of over 70 national associations representing more than 4 million small firms. I am Herbert L. Spira, tax consultant to the Council. During my service on the staff of the Senate Small Business Committee I also staffed periodic hearings on small business innovation over the past dozen years.

BILLS BEFORE THE SUBCOMMITTEE

We understand that the proposals on the hearing agenda include:

H.R. 4326, the "Small Business Innovation and Development Act of 1981," introduced by the Chairman of this Subcommittee;

H.R. 3091 introduced by Representatives Lewis, McDade (the ranking Republican member of the Subcommittee), and 10 other co-sponsors;

H.R. 4343, introduced by Representatives Neil Smith and Parren Mitchell, the most recent former Chairman and current Chairman of the full Committee;

H.R. 4373, introduced by Representatives Bedell and McDade and 40 other cosponsors, including the Subcommittee Chairman.

It is apparent that the thrust of all of these bills, supporting the Small Business Innovation Research program, enjoys extensive bi-partisan support.

ANALYSIS OF THE LEGISLATION

The two basic concepts common to the four House bills and major Senate bill (S. 881), are:

(1) application of the successful Small Business Innovation Research (SBIR) program of the National Science Foundation to the 11 agencies having a research and development budget of more than $100 million; and

(2) requiring every federal agency having an R&D budget of more than $20 million to increase its overall funding for small business research.

A side-by-side comparison of these proposals, prepared by the staff of this subcommittee, is attached as Exhibit 1.

COUNCIL POSITION

The Small Business Legislative Council strongly supports both of the prinicpal concepts of these bills—making the SBIR government-wide at the major agencies, and increasing the small business share of federal research and development.

However, we have supported and continue to stronger measures than are contained in the pending bill in several areas:

First: We advocate that the legislation be clarified to assure that an increase in application of the SBIR program is not at the expense of a lower overall small business share of federal R&D procurement. Some of these bills (S. 881, H.R. 3091, and H.R. 4326) require that the dollar amount of small business R&D funding not be reduced. However, in agencies where R&D budgets are increasing, a dollar increase could amount to a substantial percentage decrease.

We have concluded that a percentage minimum (such as is contained in H.R. 4373) is the preferable standard.

Thus, if an agency's R&D budget rises, small business should at least maintain its present position. Conversely, if the R&D budget is reduced, small business should also bear cuts that are proportionate, but no more than proportionate.

A percentage standard would be an improvement, but it would still need to be supplemented, in our opinion, because it would permit SBIR procurement to be substituted for existing small business R&D procurement, leaving the overall quantity of federal funding for small business R&D at the current depressed level.

Second: The legislation should also contain a mandate that the over-all small business share of R&D procurement would increase to a realistic level.

According to the National Science Foundation statistics, the small business share of Federal R&D funding has fallen from 3.2 percent in 1975 to 2.3 percent in 1979, a decline of 28 percent.

A one percent decline in the small business share of a $31.7 billion Federal R&D budget is a decline of more than $300 million in research dollars going to small business.

We believe that such a decline should not be ratified by the small business community or the Congress.

On the contrary, experience indicates that the small business share of Federal R&D procurement can and should be far higher.

In 1976, when the National Science Foundation was awarding 5 percent of its applied research funds to small business, Congress required the agency by statute (Public Law 94–86 et seq.) to increase this percentage to 7½ percent in fiscal year 1977, 10 percent in fiscal year 1978 and 12½ percent in fiscal year 1979.

The Foundation accomplished these goals without in any way reducing the quality of its research product. The Assistant Director of the NSF for Applied Science and Research testified in 1978 before a joint House-Senate Small Business Committee hearing that such targets: "[have] been within our capability and [have] been achieved without any relaxation of the standards of scientific excellence that is associated with NSF awards." [1]

We know from past experience that legislative goals for small business are both workable and effective. For example, the Assistant Director of the National Science Foundation testified:

"The [statutory] minimums certainly were a strong incentive to go out and succeed. There were, and there are, a variety of issues and concerns which our agency must face. The recognition by the Congress of the importance of this one certainly helped us to focus our attention on it." [2]

The National Aeronautics and Space Administration mounted a similar program of setting annual goals, which resulted in raising the small business share of its R&D budget to about 6½ percent over, (including about 25 percent of its unsolicited proposals) with a target of 10 percent for fiscal year 1978.

In these same 1978 hearings, NASA testified that the small business R&D increases were a strong positive factor in helping the agency accomplish its mission: "* * * not only has there been no reduction in the quality of research work performed for NASA by small business, but rather there has been a strongly positive record of achievement in this work. We find that many of the smaller high technology firms bring to their NASA work a concentration, flexibility and responsiveness that is unique to small and medium size organizations. When these qualities are combined with technical and managerial competence, the potential for success is excellent. Fortunately, this has been the NASA experience to a large degree." [3]

The largest government research contractor, the Defense Department, has similarly praised the R&D capabilities of small firms, stating that they are more cost-effective and more innovative than the industry giants:

"We in the Department of Defense are also very concerned about getting more small firms involved in our research and development programs. Small businesses are probably cheaper and probably give us more for our money than large businesses do. But more than a dollar value, the real innovations of this world, whether it be in new weapon systems or whether it be in new service techniques, by large measure come from the small firms which support the Lockheeds, the Boeings, the McDonnell Douglases and the other giants of the industry." [4]

In a well-documented special report on the overall picture the Office of Federal Procurement Policy, part of the Executive Office of the President, found that one-half of all industrial innovations between 1953 and 1973 originated in small businesses (having less than 1,000 employees), characterizing this as a "striking record of innovation."

The OFPP then looked at the 3.4 percent small business share of Federal R&D funds in fiscal year 1975 and concluded:

"Federal Government contracting for research and development is one area in which small firms are inadequately used." [5]

On the basis of this evidence, SBLC had previously recommended that 25 percent of Federal R&D expenditures go to small firms. Under the circumstances, we have no hesitation in concluding that (1) the 1979 small business share of 2.3 percent is grossly inadequate and harmful to the accomplishment of the nation's economic goals; and (2) agency targets for small business shares of R&D budgets should be established in the 15 to 25 percent range and phased in over an appropriate period of years, subject to an appeal mechanism which could permit temporary adjustments.

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[1] "Small Business and Innovation," Joint Hearings, Aug. 9 and 10, 1978, page 197, footnote 22.

[2] Hearings, loc. cit., page 218.

[3] Hearings, loc. cit., Appendix XXVIII, page 1189.

[4] Hearings, loc. cit., Statement of Assistant Secretary of Defense, Dale Church, page 156.

[5] "Small Firms and Federal Research and Development," Report of the Office of Federal Procurement Policy, OMB, March 10, 1977.

[6] "Small Business and Innovation," Joint Report of the House and Senate Small Business Committees on "Under-Utilization of Small Business in the Nation's Efforts to Encourage Industrial Innovation," Senate Report 95–1413, December 28, 1978.

Similar positions were adopted in the 1978 joint report of the House and Senate Small Business Committees, which recommended legislative standards if schedules could not be worked out for various agencies by the Executive Branch;[6] a Small Business Administration Advocacy Report on the subject which recommended a 10 percent small business share across the board,[7] and the White House Conference on Small Business, which voted innovation as the sixth highest ranking priority.

As a consequence of these recommendations, a bill was introduced in the last Congress (S. 1860) which proposed an eventual 10 percent target for an overall small business share of R&D as well as a one percent target for application of the SBIR program to each agency.

SBLC believes this history is useful background for consideration of the present legislation.

The Council feels that the institution of the SBIR program across the government should be paralleled by an increase in the overall small business share of Federal R&D procurement at a rate of 2 or 2½ percent per year.

On the question of whether the SBIR level should rise to one percent, two percent or three percent, and how fast such increases should be phased in, we believe answers to these questions should rest upon the balance of expert testimony which we look forward to evaluating.

EXHIBIT 1.—SMALL BUSINESS R. & D. SET-ASIDES

[In percent]

	S. 881	H.R. 3091	H.R. 4326	H.R. 4343	H.R. 4373
Each Federal agency which has a research or R. & D. budget in excess of	(1)	(1)	(1)	(1)	(1)
Shall set aside with small business concerns a percentage of the agency's research and development (R. & D.) budget of not less than (1982)	0.2	0.2	1	[2]0.2	0.3
For the second year but not less than (1983)	0.6	0.6	2	[3]0.6	1
For the 3d year not less than (1984)	1	1	2	1	2
Subsequent years:					
1985	1	1	2	2	2
1986				3	

[1] For any fiscal year beginning 1982, $100 million.
[2] Shall initiate and conduct small business research innovation program (SBIR).
[3] Maintain the SBIR as long as the budget equals or exceeds such amount.

POLICY POSITIONS OF THE SMALL BUSINESS LEGISLATIVE COUNCIL, 1981

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PROCUREMENT AND INNOVATION POLICY

For decades, Administrations of the major political parties have promised small business a "fair" or "adequate" share of federal procurement (currently running close to $80 billion a year.) The share of contracts actually awarded to small business has ranged from 16 percent to 23 percent, and small business subcontracting requirements have not been adequately applied to all large federal contract agreements.

Expenditures for federal research and development have been even more concentrated towards large business. Less than 5 percent of the federal R&D dollar now goes to small businesses, which have historically been the most fertile spawning ground for innovations in technology. In many cases the large corporations have a vested interest in continued use of existing technologies and products, which creates a conflict of interest in their R&D work for the government.

Even in the face of growing economic concentration in other areas, studies by the Department of Commerce and the Office of Management and Budget indicated that in 1975, small firms and individual inventors continued to account for more than one-half of all inventions and innovations. On 3.4% of all federal R&D dollars, small firms have produced 24 times the new commercial ideas, inventions and innovations per dollar than large companies. Government policy should encourage this inventiveness by making funds for research and development, as well as production capital, more readily available to small business.

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[7] Three Task Force Reports on Innovation, SBA, April 1979.

Resolved, the Small Business Legislative Council urges that the federal government set firm goals of 50 percent of prime contracts and 75 percent of sub-contracts for award to small businesses. In addition, the federal government should implement policies that reward innovation and encourage the traditional small business willingness to explore and expand in new directions by increasing small business share of federal R&D expenditures to at least 25 percent of the total.

The position paper—"Small Business Procurement Policy and Innovation"—is supported, as of this date, by 43 members of the Small Business Legislative Council.

American Association of Nurserymen, Washington, D.C.
American Textile Machinery Association, Washington, D.C.
Association of Diesel Specialists, Kansas City, Missouri.
Association of Independent Corrugated Converters, Washington, D.C.
Association of Physical Fitness Centers, Bethesda, Maryland.
Automotive Warehouse Distributors Association, Inc., Washington, D.C.
Building Service Contractors Association International, McLean, Virginia.
Business Advertising Council, Cincinnati, Ohio.
Direct Selling Association, Washington, D.C.
Electronic Representatives Association, Chicago, Illinois.
Furniture Rental Association of America, Washington, D.C.
Independent Bakers Association, Washington, D.C.
Independent Business Association of Michigan, Kalamazoo, Michigan.
American Metal Stamping Association, Richmond Heights, Ohio.
Independent Sewing Machine Dealers of America, Hilliard, Ohio.
Institute of Certified Business Counselors, Lafayette, California.
International Franchise Association, Washington, D.C.
Local and Short Haul Carriers National Conference, Washington, D.C.
Machinery Dealers National Association, Silver Spring, Maryland.
Manufacturers Agents National Association, Irvine, California.
Marking Device Association, Evanston, Illinois.
Menswear Retailers of America, Washington, D.C.
National Association for Child Care Management, Washington, D.C.
National Association of Brick Distributors, McLean, Virginia.
National Association of Plastics Distributors, Inc., Jaffrey, New Hampshire.
National Association of Retail Druggists, Washington, D.C.
National Beer Wholesalers' Association of America, Inc., Falls Church, Virginia.
National Burglar & Fire Alarm Association, Washington, D.C.
National Coffee Service Association, Chicago, Illinois.
National Electrical Contractors Association, Inc., Washington, D.C.
National Family Business Council, Washington, D.C.
National Home Furnishings Association, Washington, D.C.
National Home Improvement Council, New York, New York.
National Independent Dairies Association, Washington, D.C.
National Meat Association, Washington, D.C.
National Office Machine Dealers Association, Inc., Zanesville, Ohio.
National Office Products Association, Alexandria, Virginia.
National Paper Trade Association, Inc., New York, New York.
National Patent Council, Inc., Arlington, Virginia.
National Pest Control Association, Vienna, Virginia.
National Small Business Association, Washington, D.C.
National Tire Dealers & Retreaders Association, Inc., Washington, D.C.
American Association of MESBIC's, Washington, D.C.

Mr. **LaFalce**. We will next hear from Mr. Samuel Cardon, president, General Technical Services, Inc., and president, American Association of Small Research Companies.

TESTIMONY OF SAMUEL CARDON, PRESIDENT, GENERAL TECHNICAL SERVICES, INC., AND PRESIDENT, AMERICAN ASSOCIATION OF SMALL RESEARCH COMPANIES

Mr. **Cardon**. Mr. Chairman, I think I had better read my testimony.

Mr. **LaFalce**. Fine.

Mr. **Cardon**. The American Association of Small Research Companies is made up almost entirely of officers of small R. & D. and high technology companies. I am an officer of General Technical Services, Inc., a small R. & D. company in Upper Darby, Pa., which has been in business 18 years. Before that, I was associated with two other small R. & D. companies in Cleveland, Ohio—Rand Development Corp., and Horizons, Inc. for 12 years. Thus, I have had 30 years' experience in small R. & D. companies.

All the officers and directors of the American Association of Small Research Companies are officers and principals in small technically based companies, and we speak from many years of personal experiences attempting to do required R. & D. for Government and industry and commercializing innovative technology which we have developed ourselves.

You gentlemen are probably aware that Government and academic studies have shown that independent inventors and company entrepreneurs have been responsible for an inordinately large percentage of the innovative technology developed in this country. The studies recommended that incentives be provided to encourage independent and small company entrepreneurs and in that last decade only a little has been done. The legislation being considered here will make small R. & D. business incentives official Government policy and we are all for it.

The motto of our association is "More Business for Small Business." Most of the survival problems of small business would disappear if small business, whether R. & D. or not, did enough business. Thus, this legislation, which orders Government agencies to provide a portion of their R. & D. funds for grants and contracts to technical small business, can be very important in helping these companies stay productive and alive. Such mandated set-asides have worked well in the National Science Foundation and, on the basis of 30 years' experience in small R. & D. companies, I am convinced it is the only sure mechanism for getting more Government business for small business. Now you must order it.

Previous legislation which sought to provide incentives through tax benefits, really do not help the struggling small innovative company very much. Most do not make enough profits to be able to take advantage of the tax benefits. No, the direct approach of the legislation you are considering is the best way you can help small R. & D. companies by getting them more work and in the process, you will be helping the Government agencies do their jobs by making use of the great capabilities for innovation available to these small R. & D. companies.

I want to make one other point. The American Association of Small Research Companies was started almost 10 years ago to help the cause of the small technical company in the area of Government business. As part of the activities, we ran meetings, conferences, and workshops on the general topics of "Business Opportunities for Small Technical Companies in Government" and "How to Get Government R. & D. Business." Those meetings were generally partially supported by the Government agencies.

The last year and a half, the AASRC has run a new type of meeting, sponsored by large companies who were looking for new technology, products, and services from small technical companies. The idea for the meetings came from an AASRC member, Dr. Harry Pars, and it was accepted by several large company representatives and the AASRC. In three meetings, one each in Baltimore, Washington, and Chicago, there was a total attendance of some 50 companies, including 14 sponsors, and about 300 small companies. We have contacted many, many large companies and have gotten little enthusiasm for being sponsors from the large aerospace and DOD prime contractors. I must admit that a few such companies did attend one or two of the meetings.

Now, these companies have been under obligation to subcontract to small companies and I have heard some say that they found it difficult to find technical companies to subcontract to. Well, it looks to me, on the basis of the AASRC experience in these industrial innovation conferences, that the large prime contractors are not looking very hard for eligible small companies capable of being subcontractors in the R. & D. area. Actually, the large prime DOD contractors appear to be deliberately avoiding subcontracting to small R. & D. companies.

I heard just recently that it has been reorganized in a direction that will inevitably lead to its work going to large contractors in big communities, rather than to small programs as it is done now. The program spends almost half its money for evaluation and only half to support new inventions. This only reinforced my conviction that the best way to get more business for small innovative technical companies is by the kind of legislation you have under consideration, that is, legislation which orders the agencies to spend a specified portion of their R. & D. funds with small R. & D. companies.

Thank you.

Mr. **LaFalce**. Our next witness will be Mr. John Eastin, president of Kamterter, Inc., Grant, Nebr.

TESTIMONY OF JOHN EASTIN, PRESIDENT, KAMTERTER, INC., GRANT, NEBR.

Mr. **Eastin**. Thank you, Mr. Chairman.

I am here to speak today to you and really appreciate the opportunity, as an individual who has been chasing the opportunity within the Government to pursue R. & D. as an individual. I would like to relate to you my experiences over the past few years in attempting to obtain help from the R. & D. programs that are in place.

I would then like to speak very briefly to some of the aspects of the innovations process, per se, and how a person from the outside looking in, sees the Government and the large corporations and the problem we are facing with it.

I first became involved with the Government and the innovation process through an invention that has to do with increasing the efficiency of nitrogen fertilizer use in agriculture. I won't go into the details except to say that we can easily project that by utilization of the apparatus and process, we can increase the efficiency of a crop recovery of nitrogen fertilizer by 30 percent.

I felt that was significant. A large number of people in Government that I talked to felt that was significant. I talked to the Science and Education Administration people, the Department of Energy people, Biomass, Conservation, the National Science Foundation. Each of these people, as we went to them, responded to me by saying one of two things:

"Mr. Eastin, you are an individual, and we really don't have a structure to work with you. We like your idea, but we are not set up to deal with you as an individual."

And you got to the middle management people in the DOE, as an example, and they said:

> Would you consider going back and being a university professor again? We could probably fund you, you have got a marvelous idea, you have got a marvelous program. If you could just be a professor again, we would have you in a situation where you are credible.

I went to NSF and they had a marvelous program, but they could not work with me because of their definition of research. It has to be basic research in the program that is currently operative. I was doing development work because of where I was doing it, on my farm. I wasn't a basic research scientist, even though I was doing very basic chemistry research. It had nothing to do with the research being done, it had to do with the arbitrary definition that was given to it, and it was a way for people within Government to avoid me, as an individual.

"A marvelous idea, but you are doing development work and we can only support research." And in that context, I read your bill, I would commend you on your definition of R. & D. It is a marvelous thing to have a realistic definition.

Also, on the first page of your bill, I have read the word "firm". I despise that. It is an organization. It is part of the philosophy, we can't work with individuals. You have expressed a philosophy in your SBIR hearings and the things I have read about individuals, small businesses, technology, gentlemen, in the history of this country. Innovation does not come from firms, it comes from individuals. The majority of the firms—and I will read you something a minute later—start with individuals and large corporations do too.

I guess what I wanted to do was make a point to you that, as the situation exists today, without a doubt it can be stated conclusively that there is no system within your Government, within the bureaucracy that will accommodate individuals and small firms in a rather easy fashion. I would like, I guess again, to emphasize that the other thing that I was told, in other words, I can't support you, you are not credible as an individual.

The other thing that I heard so many times was a specific program does not have a charter to support you. Everything was done in charters. The biomass people, even though we were extremely pertinent to their overall mission, I was told that, well, you are not making a harvester for biomass, and we have specific funds for making a harvester for biomass. Missions didn't have to do with enhancement of the overall program. People were pigeonholed. I would hope in your implementation, assuming that you are going to get this implemented, that you consider those things to make it an effective program.

I would like to venture on now for just a minute, if I could, about what I see in my dealings with it as some of the things that are inherent in corporate structure and Government bureaucracy that need really be considered when you bring the implementation of this legislation down the line. I think I can speak from experience when I talk about the corporate structure and when I talk about universities. I was a faculty member of the University of Wisconsin at Madison for 8 years. I was a research scientist with a large industrial concern for 6 years, and the last 8 years, I have been doing R. & D. on my own, and farming to support that. So I can speak about corporate structure and function, I think, from experience, and also about universities.

As I have read some of the written testimony that has been handed to me this morning, it just makes my blood boil to see what the agencies are saying about this legislation and what university associations are saying about this legislation. I would like to speak to that specifically. I would like to start about the corporate structure by reading you—and I will submit this for entry into the record if I can—a piece of an article written by John Kenneth Galbraith. I will excerpt it:

He is talking about corporate senility. He says:

> In the first stage of development of the modern great corporation there was always an innovative and dominant personality. The names are part of the industrial legend of the United States—Rockefeller at Standard Oil; Ford at Ford; Sloan at General Motors; Firestone at Firestone; Watson at IBM; Avery at Montgomery Ward; Rosenwald at Sears; and so on and so on. The originating names can be identified with nearly every one of the Fortune 500 or companion corporations in merchandising, transportation and finance.
>
> At the second stage of this corporation development, as in the case of Henry Ford, it is strongly resisted by the original entrepreneur. Organization takes over. The requirement for decisions are now too diverse for one man. Any important action calls for a large range of specialized knowledge.
>
> The might of leadership and command continues. It is heralded in the press, acknowledging access to the corporate jet—it is even accorded a board of directors. In fact, the corporation has become a collective of its top management and operating and technical staff.

His article describes the Government bureaucracy and it describes the corporate bureaucracy very well. He goes on to say:

> In consequence of this development, this corporate senility, investment becomes cautious, analysis becomes a surrogate for action; innovation has an aspect of danger.

And I don't have a more perfect characterization of the situation. I submit his characterization of bureaucracy and corporate innovation for the record.

I look at this testimony I have in my hand presented by the human services people here today and their cries about you are going to take away funds for basic research. I read the university statement. It says you are going to take away funds for basic research. I say, hogwash; let them get involved in the process. Only those that hide their heads in the sand might suffer. I would refer you to my written testimony for detailed support of that statement.

I, as an individual person who has the technology capability will go and use that university. As a matter of fact, I have a contract with a university now to help me with the innovation process. That university will generate funds from that process, not be deprived of funds if they get involved in the mainstream. For heavens sake, let them get out where the world is real, I guess that is what I would say.

I remember at the University of Wisconsin we had a big sign over there on the main campus. It said that we, as basic scientists, were there and we were allowed to pursue the unfettered quest of knowledge. We were basic research scientists, but yet, here is an organization that has formed the Wisconsin Alumnae Research Foundation which makes a tremendous input into the basic research sciences, and it is because that institution got involved, they did something with small business and innovation with the individuals and staff that they had there.

I think these universities should be looking at it as a great opportunity, not as a threat. I would hope that if they persist in the philosophy that it will hurt basic research, that you will rebut it in your fight on the Hill on the bill. It is not a legitimate argument.

So I guess in summary, again about universities, I think people are there to produce papers and not products. Unless they are goal oriented, unless someone comes in from the outside and orients them goalwise, why they don't do it. But if they do become involved through an SBIR program, they will be more productive in the basic as well as the goal-oriented innovation.

So in closing, I guess I would say to all the people that have submitted figures on innovation and small business productivity, they are not an accident. I think that Mr. Glover's characterization of the system is extremely accurate. I think that the only way that the people that are involved in these agencies SBIR is directed at will respond is by mandate, and that if you really want to see something happen in these senile corporations, somehow, some way, the country has to put money into the hands of the innovator, the small guy that is high technology, that is sitting out there. He will put pressure on the corporate structures through new product innovation.

If he knows they can get $50,000 to start an innovation process, and $250,000 to develop it, he will go after it. He will quit a job and go after that with the dream of forming his own company, and he is the person that will cause pressure on that corporate structure. He will create pressure with new products. That is the only thing.

These middle management and corporate structures operate out of fear. Mr. Glover characterized it well. That is the only way they operate, not by what you can accomplish, but what you might get in trouble for. If somebody is pushing them with new products, they will respond. You will have innovation in the large companies as well as the small companies. And the only way the small guy can do it is with help from you.

With that, I would like to close, and thank you for your attention.

Mr. LaFalce. Thank you very much for your remarks, Mr. Eastin. Your remarks reminded me so much of so many of the statements I heard on a recent trip that I took to Japan the last week in August, sponsored by the American Productivity Center, in Houston, Tex. So many of the individuals we spoke to in Japan started their own companies, Mr. Yoweta of Sony, and Mr. Kawasaki.

I think there were two constant refrains in comparing the Japanese to the Americans. They tend to say repeatedly that we look to the long term, and it is our perception of American businesses that they look to the short term, that they look to the bottom line for this quarter, or for this year, while we look at the next decade and beyond.

And as an attorney I think I can say this, they said so many of our firms, it seems to us, are headed now by attorneys and accountants, rather than by the individuals who came up with the idea or carried on the idea which made the company what it is.

Then they look at their educational system. In Japan you have roughly half the population of the United States, but they are producing about 10 times as many engineers, I believe, in an absolute number, as we are in the United States. And I think we are producing well over 20 times as many attorneys, or more. Maybe that says something. Maybe it says something very similar to what you were saying, Mr. Eastin.

Mr. EASTIN. Might I make one more statement? You have got to excuse me for not being organized, we farmers don't organize very well, as you know. The peer-review process, as it has to do with innovation is something that we should be aware of in this area. When you put out a requirement for a person to submit a proposal to you, that is reviewed in the technical community. I have been on review boards for journals and these sorts of things, and for grant proposals for NSF and NIH, when I was an academician. I always enjoyed very much those reviews. I always got a lot of ideas out of them, too, and there are two things that come out of that. One is you stimulate thought in the technology community just by fact that you have generated all these proposals.

The second thing is that you have caused the small businessman out there who has a dream; to structure his dream, to try and get support from you. Whether he ever gets that grant or not, there has been a contribution. I think you should be aware of that. You shouldn't pass that off as being insignificant. It is a very significant thing in the context of stimulating technological innovation in the United States..

I want to read one other thing to you out of one of these pieces of testimony that just burns me up. This is from Mr. Prager from the Office of Science and Technology Policy. It is on page 3. There is a paragraph.

Mr. LAFALCE. Mr. Prager will have an opportunity to rebut this very shortly.

Mr. EASTIN. I am sure he will. I hope so. I hope he can. There must be some good reason for publishing this kind of statement. Mr. Chairman, he says:

> Fundamental to President Reagan's economic philosophy, one which is the very heart of its efforts to strengthen this country's industrial efficiency, productivity and competitiveness worldwide is a free market system, as free as possible of all government interference or subsidization. The Reagan Administration has made clear and has demonstrated repeatedly its opposition to direct Federal subsidies to industry and any government interference in corporate decision making.

Well, what does Mr. Prager think happens now? My lord, look where the contracts go. Look at the interference of Government in the corporate board room. An example of influence is the Princeton Research Laboratories of Ingersoll-Rand. They invited me back for 3 days to review my invention. In the process—it is a fantastic facility—I said how do you fund this?

And he said, well, we are very selective. This was the director. We are very selective about what we do here in relation to Government objectives, and I am to think the Government isn't influencing Ingersoll-Rand, in their whole Princeton Research Laboratory setup? Their R. & D. laboratory program centered on Government funding. I mean, this is naive to think Government doesn't subsidize industry and influence corporate decisionmaking. Government bureaucracy and the corporate bureaucracy are so intertwined that it is really ridiculously naive to make that kind of statement.

Somehow the pressure has got to be put on agencies to divert some of that funding to individuals and small business where your studies have shown it to be productive. You have got to do it. Get off your duffs and do something, darn it. I am sorry to give a little lecture, but you must act.

Mr. **LaFalce**. I am so sympathetic to your comments. Insofar as I am concerned, at least, you are preaching to the Chair. The relationship between the Government and the private sector is inevitable. It is necessary. It is not a question of whether there is going to be a relationship, it is a question of what that relationship is going to be. Whether Government is either going to be of assistance to or a hindrance to the private sector. It is not by definition going to be neutral. Any action or inaction on its part is going to have a direct effect.

When you say that you don't do things to influence, you don't grant subsidies, and don't believe in subsidies, and don't believe in subsidies to the private sector, you can point out, I think, literally hundreds of companies, how, even under the Reagan administration, we have seen issues that do that.

The All Savers Certificate comes to mind, which is included in the tax bill. If that is not the biggest subsidy, the biggest bonanza for the biggest banks in the entire United States of America that I have seen, I mean I don't know a boondoggle when I see it. And boy, I think that is the biggest one I have seen in a long time and it was right smack there in that tax bill that, you know, we didn't have a chance to offer an amendment against that boondoggle.

There was a subsidy of the banking industry, billions of dollars, billions of dollars. Not just to the 1 percent or smaller, less of the banks that are having a little bit of difficulty, but to every bank in the United States, no matter how affluent they are.

Well, we could go on and on and on. I think we have to end our little colloquy and go to the other members of the subcommittee.

Mrs. Snowe.

Mrs. **Snowe**. Thank you, Mr. Chairman.

I just have really one question. I, first of all, want to thank all of you for your testimony. Could you tell me how you view the structure of the bills that have been presented to the Congress, especially in considering the percentage points? Each bill differs in terms of the percentage that would be set aside for R. & D. Do you have any comments on that? Are you satisfied with the bills as they have been introduced? What would you prefer for a percentage point, 1 percent? Graduated percentage, as has been introduced in Representative Bedell's bill?

Dr. **Pars**. I will make a comment. Let me just tell you that the small business community at large, themselves, may have a philosophical concern about set-asides of any kind. A lot of us do. We hate to see anybody, any branch of the Government, or any corporation, or any system be directed to arbitrarily set aside something.

The reason we come to the conclusion, and overwhelming support for a set-aside, and in spite of that philosophical concern is because we have been listening to these studies coming out of industry, Government, and university laboratories. These are distinguished people who have been saying the same thing over and over again. It is not that these facts are wrong or debatable, or unquestionable. There is nothing to discuss.

It is quite clear that the stimulus must come from where it always has come from. This stimulus to our economy, the idea of creating new enterprises, and new jobs must come from the small business sector. The reason for the set-aside, and it is really quite low, is that no other reasonable plan has been put forth to insure the participation of the small business economy.

What we are talking about is balancing the amount of funding that is going to the community small and big business innovators. The big business community is creating and innovating, but not nearly as much as the small business economy of this country. And so I say two-tenths of 1 percent is piddling in comparison to the overwhelming productivity of the small business sector.

The only reason it is that low as far as I can tell is because of the concerns people have for any set-aside. I think 25 percent is the right number; not two-tenths of 1 percent.

Mr. LaFalce. It ought not to be so low that it is meaningless, on the other hand. I have great qualms with two-tenths of 1 percent as a starting point.

Mr. Motley. I would at this point, I think, agree with Mr. Glover, who testified previously, that it is very important that this legislation get through the Congress. NIFB at this point would agree with Jere Glover that it is extremely important that the legislation move forward and get on the books and that we get the program set up.

I think it might be dissipating at this time to argue much about percentages. If we get the legislation in place, we can always come back and adjust it later. The important thing is to get the program operating.

Mrs. Snowe. Thank you.

Mr. Cardon. Could I answer, too? I don't disagree with Harry Pars too often, but I disgree with him here. The idea of a set-aside or any kind of incentive—because I think most of the other areas of the economy do get such incentives—I don't think that the small business community is in a position to be any more charitable or more patriotic than anybody else.

I think we can contribute more if we do get some of these incentives. I would agree that to get something on the books is terribly important. I would sacrifice almost anything to get this kind of law on the books. I wouldn't say that something is too small to be meaningless. It isn't meaningless once you have set a precedent on which you can build.

Your initial National Science Foundation bill, as I recall, was just a couple percent. It was gradually built up to a respectable figure. I think it is terribly important to set the precedent now. If you have to sacrifice in order to get that precedent, I would do it.

Mr. LaFalce. Any other comments on that?

Mr. Eastin. I would like to, I guess, echo that. It is extremely important that you do something here. You sit and read the testimony from the agencies, and I guess about the only thing you can conclude from it is that they need to be saved from themselves. They need to do something to, I don't know, keep them from learning. I don't know how you do it. Something has to be done.

You have got to pursue the thing. When you pursue it and develop something, for heaven's sake, involve some people that have experience in innovation and technology in the oversight organization that you get on this. Don't take them all from corporate boardrooms.

Mr. **LaFalce**. Thank you very much.

I am hearing a number of things from you and from the testimony that we have received this afternoon. Basically, everybody is philosophically in favor of the concept of giving awards to small businesses for R. & D. And you people are saying, I think basically, despite any difficulties, it is imperative that legislation be passed mandating certain set-asides.

Some say there is no philosophical opposition to the set-asides. Some say even though we have philosophical difficulties, with set-asides, the institutional bias which has over the years so evidenced itself, and gives no indication of diminishing in the future, mandates an exception to our philosophical difficulties and therefore, we should have a legislative mandate.

This afternoon we are going to hear while we philosophically favor the concept, certainly not the means of achieving it, there is something inherently wrong about the set-aside. I think this subcommittee will be forced into a dilemma when we consider this legislation. That is, whether to proceed, aware of the fact that any set-aside program will in and of itself present its own difficulties, or to do nothing, as has been done over the years, and see the condition that has evolved over the years continue, and continue, and continue.

I think I know the general direction the subcommittee will take.

Mr. Bedell.

Mr. **Bedell**. Thank you, Mr. Chairman.

First, I should say, Mrs. Snowe, as far as I could tell, there is no particular competition among the various bills.

Mr. **LaFalce**. We will probably wind up having a clean bill after we get together and try to decide the best approach. I also want to point this out, too. You know, we do have a Senate. It is my judgment that the Senate is probably going to find itself persuaded more by the testimony of the agencies than this subcommittee, and assuming it gets to conference, it might be good to go into conference with something to negotiate with.

Mr. **Bedell**. There are 82 cosponsors of the bill in the Senate. With 100 Members, I would think there is a pretty good chance of passage of a bill with 82 cosponsors. Further than that, the fact that there are so many similar bills simply indicates the great support there is for this concept in the House.

I would like to read for the committee from a report of the Comptroller General, dated August 21, 1981. It is a report on DOE's alcohol fuels award process which resulted in questionable award procedures and limited small business success. One point therein reads as follows:

> While we have made recommendations to the Secretary of Energy aimed at enhancing small business involvement in future competitions, the Congress may

also want to closely monitor the success of small business. In the event the desired level of small business success is not achieved, the Congress may want to consider enacting legislation to obtain more substantial participation by small business in these activities.

I take it that it is the unanimous opinion of this group that that success has not been achieved and the need exists to pass legislation if we are going to see success achieved. Is there anybody on the panel that does not so feel?

I thank you and yield back the balance of my time.

[Mr. Eastin's prepared statement and attachments follow:]

PREPARED STATEMENT OF JOHN A. EASTIN, PRESIDENT, KAMTERTER, INC., GRANT, NEBR.

Thank you Mr. Chairman, for this opportunity to share my views of and experiences with the innovation process and to comment on the proposed SBIR legislation which is before this committee. I want to relate to you some thoughts about innovation per se, the general climate for technological innovation in the United States, and the current as well as potential activities and interactions of government—large corporations—the financial community—academia—small businesses and last but not least individuals as they relate to technological innovation. I am not here to represent an organization or an agency. My remarks are those of an individual who has been involved in research and development in the corporate and academic communities, has worked as an individual in research and development on a high technology invention and I am currently working on the manufacturing prototype of my invention with the hopes of commercializing the invention. The specifics of my background in research and development are a B.S. degree from the University of Nebraska, M.S. and Ph. D. degrees from Purdue University, 6 years as a faculty member at the University of Wisconsin, 5 years as a basic research scientist for DeKalb Ag. Res. Inc. and finally the past 8 years as an inventor-farmer-small businessman. My interest is in the stimulation of technological innovation in the United States and I hope my remarks will be of help to you as background for your work in fashioning a realistic SBIR legislative approach to government's involvement in that goal.

INDIVIDUALS, SMALL BUSINESSES AND INNOVATION

Innovation has historically been the province of individuals. Reinforcement of that fact as it applies to the United States can come from many sources but the example given by John Kenneth Galbraith (exhibit 1) is as compelling as anything that can be said on the matter. He points out that virtually all of today's Fortune 500 companies evolved from an individual who developed an idea. That fact speaks for itself. Galbraith goes on to point out that as such corporations grow and reach a stage where they are not dominated by the original entrepreneur there is often a period of collective management and innovation with much initiative and vigor displayed. This stage in corporate growth can be likened to the structure existing in many of today's small businesses where we know innovation flourishes when the resources are available. Recent studies (House Science and Technology Oversight Subcommittee Hearings testimony July 22, 1981) clearly establish that today small businesses and particularly individuals who are the dominant force in those businesses, are very efficient at bringing about technological innovation and especially so when compared to large corporations. This current and historical role of individuals as well as small businesses in innovation should be heeded and be the cornerstone for any SBIR program you structure to stimulate technological innovation.

BUREAUCRACIES AND INNOVATION

Bureaucracies in general bury the individual. Consequently, innovation is not one of their strong points and in general the larger the bureaucracy the less innovation. The correlation holds well for organizations ranging from the largest socialist societies down through the private sector corporate bureaucracies. Today's society in the United States has come a long way down the road toward being substantially bureaucratized. This is true for the private sector as well as for government and academia. Again, it would be difficult to describe the situation as well as Galbraith has done so I refer you to his remarks (exhibit 1). He notes that as corporations grow they generally become bureaucracies run by management teams. "Short term planning takes the place of long term planning, analysis becomes a surrogate for action and innovation has an aspect of danger." It might be paraphrased to say that analysis becomes the surrogate for risk taking. It has been my experience that these management teams consist largely of financial, legal, management and marketing specialists and the same sorts of people are found in middle management as in top management. The analysis tasks are largely assigned to middle management where decision making consists of being able to hedge one's positions skillfully. Middle management has the least incentive for taking risks as well as the least capability for making technological assessments and judgements. Innovation which by its very nature is risky takes a back seat. The safe goal in life is to preserve the very comfortable status quo so innovation is effectively stifled and our large corporations have become notable for avoiding risk and thus innovation. This is all in spite of the fact that large corporations are in an extremely good position to take risks. In this context the data available showing the superior productivity and innovativeness of small companies and individuals as contrasted to large corporations is no surprise. Galbraith calls this whole syndrome "corporate senility" and makes suggestions for coping with it. In my opinion the only proven antidote for senility is activity and it applies to corporations just as well as it does to people. Innovation activity will reverse the corporate senility process and SBIR legislation could help to force that activity. The important thing to this committee however, concerning Galbraith's or any other realistic analysis of the situation is that they will all reach essentially the same conclusion. Further, this characterization of large corporations can be transposed almost directly to today's government agencies, research institutes and academia where most individuals are lost in the system so innovation infrequently surfaces. Only the application of massive resources brings new developments and those come at an extremely slow pace. The organizational structures inherently punish rather than reward risk taking. Without risk you are without innovation.

This character of corporate, academic and government bureaucracies is not a figment of someone's imagination. It is real. To emphasize the reality, some of the experiences I have personally had with the system are related below. Before that a brief statement about my invention is necessary to try and provide the context for my experiences. The process chemistry I have developed facilitates small scale atmospheric pressure conversion of gaseous anhydrous ammonia fertilizer to a non-pressure ammonium nitrate fertilizer solution form. The increased value of the non-pressure fertilizer solution is well established so economic forecasts on the value of the process can be reasonably made. Additionally, a potential savings in total use of nitrogen fertilizer can be projected at 30 percent. Equivalent energy savings can thus be projected. Considering that each pound of anhydrous ammonia nitrogen represents the use of about 22,000 Btu's of natural gas for synthesis, the energy conservation implications are rather obvious. With this potential there was a great deal of interest in the process by a broad range of people that I tried to obtain help from after I exhausted all of my resources working on the project.

Large Corporations.—These contacts included Emerson Electric, Whitaker Cable, Allied Chemical Co., Agrico, Occidental Petroleum, DuPont, Ingersoll Rand, Estech Chemical, Monsanto, International Minerals and Chemicals, Valmont Industries, DeKalb Ag. Res. Inc., Farmland Industries, Sperry New Holland, John Deere Co., International Harvester and many venture capital organizations. All of these companies expressed strong initial interest in the concept. I would then get assigned to talk to the legal staff or someone in middle management with a corporate development title of some sort. Many of the legal people made the decision that they would not evaluate the process on a confidential basis. These companies were usually doing business in this technology area. They consistently pointed out to me that their legal exposure was just too much for them to risk because they had so many people involved that they simply could not be responsible for them on confidential disclosure basis. They countered with a request that I sign a waiver of rights for them so they could evaluate. They would assure me verbally that they would not exploit me but a confidential disclosure agreement left them exposed to legal action by me if the process was exploited by an individual who might leave their employment and they did not have control over that. In short I was not able to deal with them. If I talked to middle management first in the companies that were doing business in the technology area they approached the project from the standpoint that they already had a large R&D program in the area and knew some farmer could not discover something they didn't already know. It was the corporate NIH syndrome, not invented here. Ergo, risk taking is not a part of large corporation management. Companies not active in the technology area but interested in the economics generally agreed to a confidential disclosure. Their approach was one of lengthy analysis and then rejection of the project. The pattern was very consistent. They did not have the staff to make an adequate technical analysis. Analysis then was inconclusive, a surrogate for action. I was told repeatedly that if I had a unit in the field operating they could justify spending a lot of money because it looked good and it would then be a marketing project. In effect they were saying it would then be a short term business planning exercise. They understood and were comfortable with market development but not with product development. The obsession with short term rather than long term planning and development was ever evident.

Venture Capital.—On the venture capital front I searched far and wide and found many sources of capital for market development but one for product development. Funds for development work simply were not available from entities that labeled themselves as venture capital organizations. They continually said it looks like a great project and just as soon as you get it in the market we can help you. Testimony before the House Science and Technology Oversight Committee on July 22, 1981 reinforces the fact that my experience was the norm and not a unique experience. The venture capital people at those hearings could not cite one instance where development work had been funded by the so-called venture people. Each and every project they invested in was at a later stage of development. The venture capital people are in reality very similar to the large corporation in their approach to new technology. If you need a business plan we can help you but we do not become involved in development work. It is too long range in character. Venture capital for individuals and small businesses to fund development work does not exist in the so called venture capital market. In retrospect it is not surprising since it was my experience that the people running venture capital organization are cut from the same mold as large corporation management and in many cases are people drawn from corporate and financial institution staffs.

Government.—When I attempted to obtain help from the government agencies that had R&D missions and grant programs in this technology area I encountered the strictest Webster definition of bureaucrats. Except for TVA I was told in each and every interview that my invention was a marvelous idea—BUT. At TVA I was told by the administration that the idea would never work and even if it would there was no way it would be practical. I was told by the technical staff later that the NIH syndrome was very real at TVA. I did receive some technical assistance from staff on a personal basis and was told if I did come to TVA for support on the project my chances of getting any as an individual were essentially nil. In those offices where my invention was a marvelous idea I heard one of two things. Either our charter doesn't fit or we can't work with individuals. In some offices the charter was close but they knew of another office that had more direct responsibility in this area. I spent several days in Washington and was actually referred back to some of the offices I had been sent from by people I was sent too. If that sounds confusing, it is because it was. It was a vicious merry go round of passing the buck that was very difficult to believe even though it had just happened. I had the impression that no one in the agencies had responsibility for anything or at least they had all learned to rationalize that there was someone else that could handle your situation better if you were not with some institution they had done business with before. At NSF the charter did not fit because their definition of research excluded me. They made the judgment I was doing development work and they are restricted to support of basic research. As you and I both know, that judgment is a matter of perspective. It seems clear to me it was just another way of using our charter doesn't fit to avoid working with an individual. They did in fact tell me I would have better luck with a proposal if I would go back and develop a university affiliation. Several persons in DOE told me they were not set up to work with individuals. They also suggested I should return to be a professor or associate myself with a contracting organization they had already done business with and they could then support the project. At USDA they again could not work with me as an individual. I had a good idea and data, my credentials as a scientist were acceptable, but I as an individual was not a credible, or maybe comfortable, business entity to work with. Clearly our government does not have an effective means of fostering innovation by individuals. The bureaucracy has however established effective operational procedures for precluding access by most individuals to R&D grants and contracts. The agencies prefer to deal with other bureaucrats and have institutionalized the R&D system to the point where only large institutions (large corporations, universities, consulting firms and research institutes) can deal effectively with them. They have opted for a minimum risk rather than a maximum productivity at an acceptable level of risk. The safe thing is to preserve the status quo. Thus, except for the very small experimental OERI and NSF programs there is effectively no place for an individual innovator to go for government assistance and there is no place he can go and compete on a fair basis for R&D contracts. The NSF program is limited to basic research and OERI applicants must have projects with direct energy implications. Consequently, these two programs applicability to innovation in general is very limited and the funding level severely limits them as well. This is in spite of the well established fact that innovation stems largely from individual activity. The system clearly needs overhauling if the country is to gain the use of and benefit from the most valuable and productive resource the nation has for innovating, INDIVIDUALS.

WHAT CAN BE DONE?

There is little likelihood that corporate philosophy and mode of operation will change for any reason other than necessity. Fear of market loss and thus demise of the corporation and consequent loss of their jobs is the only thing I have personally seen that causes management to innovate or allocate other than a nominal percent of resources towards innovation. Further, it is evident that the only way the government bureaucracy will change is by force of legislative mandate. Goal setting and executive orders have been directed numerous times at the problem of R&D distribution and innovation with no results. The Congress cannot change the corporate scene directly by mandate but they can mandate changes in government programs that will without doubt have effects on the corporate R&D scene. Congress must mandate changes in the government programs if it expects innovation to blossom and become the force it was historically and still can be in this country. Seed capital for development work must be provided by the government if individuals and small businesses, our best resource for innovation are to be effectively utilized. Tax policy programs and those sorts of incentives may mean something to the large corporations but they mean nothing to the true innovator who only has a dream. He needs help in terms of money and will worry about tax policy by hiring a lawyer and accountant once he is successful. At the idea development stage that is the farthest thing from his mind. It is my opinion that an SBIR program that truly facilitates the involvement of individuals and small businesses in the innovation process in this country will have far reaching effects on the corporate R&D scene as well. As new products develop from support to innovation and enter the marketplace competition will force the corporate giants to take a new approach to R&D. The one thing the large corporations are capable of responding to is fear and when they are losing a market you will see R&D within that framework. It is my firm belief that pressure from new and improved products is the only thing that will bring this about and individual innovators as individuals and in small businesses are by far the best resource the country has to accomplish this. They have the ideas and technical competence but need seed money for R&D work. That sort of money is not available in any significant quantity from the private sector. We have advanced technologically to the place where the expense of R&D generally precludes the participation of an individual in the innovation process except as a part of an organization. The ideas for innovation still do and always will reside in the individual but as the situation now exists in our society there is no good vehicle for development of those ideas. A program such as the SBIR set aside legislation is a realistic approach to furnishing that money. Those individuals with an abundance of ideas are out there and a well designed program can reach them effectively. Once their ideas are nourished through the R&D stage there is plenty of capital, now called venture capital for market and manufacturing development activities.

COMMENTS CONCERNING POSITIONS BY OPPONENTS OF SBIR SET-ASIDE LEGISLATION

Academia.—At the Science and Technology hearing of July 22, 1981 the position was advanced that an SBIR set aside would erode support for basic research. I presume the same position will be taken by the AAU representative testifying at these hearings. The contention is that the legislation would set aside a specific portion of an agencies basic research budget and that would then go to SBIR applicants so the funds would not go to basic research and further this would isolate the funds from open competition. This is as if to suggest the present system is one of open competition. The bias in current granting procedures is so overwhelmingly skewed towards institutions that one is amazed to see persons of scholarly background utter such a statement in public. This position also implies individuals are not capable of basic research conduct or ideas, which is completely contrary to the historical record. An SBIR set aside would only be a small dent in rectifying a long standing government R&D system bias that favors institutions dramatically in both the private and academic sectors. The experiences I related earlier testify to the extent of the bias and the data available on distribution of grants and R&D contracts just as vividly shows the pattern. The associated data on small business versus institutional productivity reinforces the need for a set aside if the government and the people of the country are to get their moneys worth out of government R&D dollars.

I would contend that an SBIR program modeled as projected on the NSF experimental program would provide rather than reduce funds available to universities for basic research. The model program literature encourages the use of university personnel and facilities on a contract basis. Faculty will by virtue of the program be brought into contact with innovators and ideas will develop based on those contacts. Patents and products derived from those cooperative R&D activities will in many cases be jointly owned by the university and the innovator. Many major universities have active patent programs as well as research foundations to help commercialize discoveries. They have found such programs rewarding in terms of generating revenues which are plowed back in research and educational activities at the university. I have had personal experience with the Wisconsin Alumni Research Foundation and it is a tremendous resource for that university. Further, I am currently negotiating a contract with the university of Nebraska concerning patents which might arise from research I plan to conduct cooperatively with them in the technology area of my invention. We anticipate the contracts will result in revenue for the University as well as myself. A basic research project will also go forward in the University that would not have been pursued had I as an individual innovator not sought the university assistance. The NSF format definitely encourages this kind of interplay and there will be a great deal of it under an SBIR program. Innovators are intelligent enough to use the excellent help that can be obtained through a university. Realistically, the only way basic research could suffer as a result of an SBIR program would be if a particular university decided to stick their head in the sand and not participate. If that is the case that university is not in the main stream and should not receive basic research support from the government in the first place. It is very difficult to visualize how basic research at a good university could do anything but profit from an SBIR program.

Aside from generating revenue for research and education, I personally feel an SBIR program could do a great deal to stimulate university productivity. Universities as they exist today promote faculty primarily on the basis of publishing scientific papers. Truly basic research is not a productive venture in those terms. Consequently, the bulk of the research conducted at universities is a hybrid of basic and applied research with a strong bias to the applied. It has been my experience working in a major university system as well as working cooperatively with faculty while in the private sector that studies on innovative ideas can fit very well into the university research format. Universities are a tremendous intellectual and physical facility resource. Their use needs to be encouraged in any SBIR program. Intelligent and aggressive use of university physical facilities will put an extremely costly part of R&D work at the disposal of individual innovators for a very minimal price. The intellectual resource will come with it and the innovator and university will both benefit. Faculty members in general get very excited and productive when involved in programs to develop basic knowledge or a combination of basic and applied knowledge for application to the solution of a specific problem. I have found them to be much more productive when an application goal is in sight as contrasted to the normal publish 2 papers this year routine. A further aspect of SBIR involvement with the universities is that graduate students are the best source of technical labor that can be found anywhere. They will by necessity be doing much of the cooperative university-SBIR innovator project work and thus will be intimately exposed to the innovation process as well as to the basic research philosophy of the university. That exposure should be a valuable component of the education received by the graduate student and I think will bode well for the future of technological innovation in this country. Experience is still by far the best teacher mankind has ever known. There is no substitute for it. Graduate students, the technologists of tomorrow, will have a chance at innovation education through experience.

The university association lobbyists have made the point that all of the set aside funds might, at the agencies discretion, come from the basic research side of the agencies budget. That is a legitimate concern and should be specifically addressed by the legislation or the regulations concerning it.

In summary, academia should benefit, not suffer from well designed SBIR set aside legislation. "The Unfettered Sifting and Winnowing of Knowledge", as basic research is often called in the Halls of Ivy is not incompatible with but will benefit from SBIR set aside legislation.

Government Agencies.—The refrain heard at the Science and Technology hearing on an SBIR set aside and technological innovation as well as in conversation with agency people is consistently that the objective of the SBIR set aside is a good and honorable objective but the set aside is not the way to implement it. Four major arguments surface in any dialogue with them.

The first is that a set aside would take an agency's flexibility to manage their programs away from them. They can not be effective managers if they are told what to do. They suggest a goal program on small business involvement instead of the set aside. The simple fact is that the goal programs have been tried repeatedly by Congress and the executive branch. They have not worked. The agencies prefer to work with the large corporations and institutions because it is a known thing to them, easy and they do not have to take any risk in the judgment making process even though it is more expensive and less productive than working with small business. Legislative mandate is the only way Congress can be assured of getting small business involvement.

The second argument is that technology transfer programs should be pushed as a more productive way to spend money in innovation than an SBIR program. The position advanced by SBA is that technology transfer programs reach many more people than a program such as an SBIR will at a far smaller cost per client. The fact that an agency can be that short sighted should convince Congress even more of the need for SBIR legislation. It shows clearly the agency does not understand the innovation process and needs to be told what to do. The question that SBIR addresses and the agencies need to address is not whether and how you want to disseminate information on technology but one of how do you stimulate technological innovation. One answer is an SBIR program. Information retrieval systems abound in our society. They are available through all major libraries and universities. Persons and firms with technology capabilities are quite aware of the services, their capability and the low cost of using them. Those truly interested in innovation gain nothing from the technology transfer programs they do not already have access to. Cataloging and publishing of information can be a legitimate function of agencies but to spend money and effort on the technology transfer program such as for example SBA is pushing is a waste of time and money. The true innovators do not wait for the information to come from an agency but find it on their own far ahead of the normal lag of coming through a technology transfer program. This will be especially true of high technology innovators. The old adage of you can lead a horse to water but you can't make him drink applies directly to technology transfer programs and innovation. Most of the information distributed by those programs will find an inactive bookshelf or a waste basket as the repository. The horse that did not seek the water in the first place very seldom drinks. Information is available now through the existing information retrieval systems. It can and will be obtained readily by those persons who are capable of technological innovation without a technology transfer program that is being touted as a substitute for an SBIR program. Development money, not information is the missing factor for innovation. It appears that the agencies want a technology transfer program because they either do not understand the nature of technological innovation or they are more comfortable with instituting another internally controlled program that will enlarge the internal bureaucracy and keep them from being involved in the real world of individuals, small businesses and innovation. An SBIR program involves making judgments and that has a connotation of risk whereas technology transfer involves setting up a computerized mailing list, something they are comfortable with and can say we sent out 5,000 mailings this month. You must mandate an SBIR set aside.

A third argument is that the evaluation process in an SBIR program would be too difficult to manage effectively. That can only be construed as an excuse to not do something. The evaluation program in itself can do a great deal to stimulate innovation in the technology community if it is well designed and run. The agency administrators view it as risky to try and develop and manage something they do not have a lot of experience with. Risk is something they are against without even realizing it because of the very nature of their bureaucracies. Risk however is necessary for innovation. The fact is that there is good experience in government with an SBIR type program. Roland Tibbits and his staff at NSF have extremely valuable and effective experience from their experimental program which can be called on when working with the top end of the technology end of the innovator spectrum. George Lewett and his staff in the OERI program have a wealth of experience and worked out a program for working with innovators across the whole spectrum of technological competence. Aside from these two programs the Butte, Montana Center For Innovation has accumulated valuable experience in working with innovators across the spectrum using the concept of developing a partnership with the innovators. Aspects of that have been successful and can be effectively incorporated and used along with the experiences of the NSF and OERI programs in the design of the SBIR program. There is adequate experience to use as a base for establishing an effective program to evaluate and administer a program on the broad range of proposals an SBIR program is sure to receive. That argument should not be allowed to prevail as an excuse for maintaining the status quo.

The fourth argument advanced by the agencies is that we are now committed to a free enterprise market oriented system in which government is not be an influence.

They state, business innovation and development work and the financing thereof are the proper domain of the private sector. The capital needs for innovation work will flow from the private sector based on sound business investment decisions and the entreprenurial spirit of America. In the offices of the agencies and OSTP and the parlance of textbooks on economic and free enterprise this is a grand and glorious concept as well as a noble pronouncement. It only needs to be preceeded by HEAR YE, HEAR YE. In today's United States, the real world it is ridiculous. It has to be characterized as being either extremely naive or extremely self serving. In either case it is a do nothing approach. Leave the technological innovation problem alone and it will go away is the course of action. Capital for development work by small business and individuals is not available in any significant quantity from the private sector. It is available only for market development work. The real fact is that technology is advancing at a frightening pace in the eyes of the non-technical individual in the private sector who might have financed development work 20 years ago when he understood everything a lot better. He is now going to invest his money in a high yield money market fund. Frand (exhibit 2) has pointed out that historically we could view technological innovation cycles in terms of 20 years. Now a cycle can realistically be viewed as taking 3 to 5 years. With that kind of turnover in technology, judgments and investments are risky. The investor from the private sector looks for the high assured yields on his money and protects it rather than risks it. The individual with the high technology capabilities very seldom has financial resources to risk. Thus, funding an individuals innovative ideas at the development stages is seldom achieved outside of an institution in the private sector. When a project gets to the market development stage, that represents short term planning and money is available because the investor understands it. As noted before the cost of facilities and equipment for doing R&D is so great in today's world of high technology that it is generally out of the reach of individuals and small businesses, the innovators. SBIR legislation could provide money for them to gain access to university facilities. Again, the realities of the venture capital market are that essentially none is available from the private sector to support R&D by individuals and small businesses.

Concerning the matter of no government influences on R&D in the private sector, it is truly amazing to hear such a statement. Government is so intimately involved in the large corporation R&D in this country that it is impossible for government to not influence it. The only way would be for the government to stop R&D funding. Virtually every major company R&D program in the country is based on, intertwined with and funded by government R&D objectives and money. Those who do not think so need only to visit a few of those R&D facilities and they will very quickly realize the influence of government on private sector R&D. The question then is not one of government influence on the "free enterprise" system and private sector R&D, but one of policy on the manner in which that influence is rendered. Government agencies have demonstrated that the goal setting and executive order approaches to involving small business in R&D do not work. By their own studies they have just as clearly demonstrated that small business is infinitely more productive than large corporations in most R&D work and much superior in innovativeness. The SBIR legislation objective is and should be to stimulate innovation. It should not be perceived as favoring small business or a threat to the free enterprise system. Individuals and small businesses and particularly individuals in small businesses are definitely the best resource and vehicle the country has to bring about innovation. The SBIR legislation will be for the United States, not small business and it should be advanced in that light. The agencies should not be allowed to continue letting what they think they know keep them from learning. They need to be saved from themselves.

BENEFITS OF AN SBIR PROGRAM OTHER THAN GRANTS

The potential availability of funds to individuals and small businesses will foster serious consideration of idea development from large numbers of people that would not have considered developing an idea because of financial limitations. Preparation of a proposal requires structuring the concept and as the innovative goes through that formal definition and structuring process he will frequently gain new insights. Thus the very existence of an SBIR program will in all likelihood stimulate innovation even if a grant is not awarded. The individual will have taken a step in the innovation process that he would not have taken otherwise. The true innovator will pursue the problem or an associated one once his interest has been peaked and he knows a format exists where he has the potential to get assistance.

In the review process for an SBIR program many individuals will be exposed to the SBIR program as reviewers. Those persons by necessity will have technical backgrounds. Many will have innovative tendencies which have not been developed because there is currently very little potential in our system for them to develop an idea. They have been comfortable as scientists and although intrigued at times with innovative ideas, not willing to risk their own resources to develop the idea. The institutional system they currently exist in will likewise not pursue their ideas. A significant number of these people will make their own SBIR proposals once they have been exposed to the system through the review process. Some of the best technology minds in the country will be brought into the innovation process because they will learn that a format for them to participate exists. They only need exposure.

The benefits to universities and to innovation education were discussed earlier and in my estimation will be very significant.

SBIR grants and contracts will pay off in the form of new products and processes and improvements on old ones. As this happens competition will force the large companies to reconsider their attitudes on innovation. Hopefully this will lead to them allocating more resources to R&D and we will see that revitalization of American industry that is really the subject of this proposed legislation.

SUGGESTIONS CONCERNING THE PROPOSED SBIR LEGISLATION

The word firm is prominent in the first paragraph of each of the proposed bills. That word should be changed or added to in order to include individuals specifically. They are the best proven source of innovation and as exemplified by my experiences will be discriminated against in the agency programs unless it is mandated that they are to be included.

The definition of research or research and development contained in the bills is an extremely good one. That definition is critical to the eventual success of any such legislation. The agencies will attempt to modify it and that should not be allowed.

Basic research budgets of the agencies should not be allowed to bear the set aside allowance disproportionately.

The legislation should establish an advisory board and require that an academician, a small businessman, an individual innovator and a staff person from each of the NSF, OERI, and CFI programs be appointed as members of the board to work with the Office of Federal Procurement Policy in promulgating and issuing regulations. The private sector appointments should be real world people and not lobbyists or association executives.

At least a portion of the SBIR contracts should be written as partnership contracts so as to obtain the government a potential return on the money invested. Obviously many projects will not be winners but I believe enough will be that the program could eventually evolve to one that does not cost the government money, if the partnership approach is taken. The government should be able to develop a partnership with innovators that will be good for both parties. The Center For Innovation program in Butte, Montana (See Science and Technology Hearings—Luff testimony) might be used as a model through which to funnel a portion of each agencies set aside and the results could be compared at the end of a 5-year period with the in-house agency results. That should give a reasonable test on a structure and partnership approach such as CFI uses versus the various in-house programs which the agencies might evolve and run.

[The Washington Post, Feb. 11, 1981]

CORPORATE SENILITY

(By John Kenneth Galbraith)

At least since the deaths of J. Edgar Hoover and Gen. Francisco Franco, both once thought important exhibits to the contrary, it is generally agreed that man does not enjoy immortality. There is a life span in which youth and middle-aged vigor give way, eventually, to possible senescence and certain demise. In contrast with this cycle stands the modern corporation, the central furniture of the free enterprise system. It is forever, its vigor remains undiminished however numerous its years. It is like Tennyson's brook. Thus its advantage over mere humans. That corporations have a tendency to age, become senile, is not discussed. It is something that very much needs discussion.

We accept that our older industries are in trouble. Steel, automobiles, railroads, other heavy industry, some textiles, along with such earlier basket cases as shipbuilding, are all cases in point. No one should argue that there is a single or simple reason. In all the industrial countries the second- and third-generation labor force deserts these industries; in Europe they have been saved or partly saved by migrant workers from southern Italy, Turkey, Yugoslavia, Portugal and other rural lands as, in equal measure, the industries in Detroit and other northern cities have been saved by migration from the Appalachian plateau and the South.

The modern reliance on monetary policy is also rather precisely designed to punish these older industries. It acts against inflation by high interest rates and astringent credit and is effective only to the extent that it induces idle plant and recession. The high interest rates discourage investment; and when old plant is idle because of recession, new plant is not added. New plant is almost always more efficient than old.

Were one designing a system for suppressing productivity in the vulnerable parts of the economy one could not do better than to ask for the present emphasis on monetary policy. It's too bad, in a way, that the old notion of left-wing conspiracy has fallen on such evil days. Otherwise one could suggest in a plausible way that some exceptionally subtle Bolshevist had got hold of economic policy in the United States as also in Britain.

But we must now also open our minds to the idea of a definite life span for corporations, one that does not end (perhaps unfortunately) in death but one that does lead on to terminal senility. The case, when it is examined, is persuasive.

In the first stage of the development of the modern great corporation there was always an innovative and dominant personality. The names are part of the industrial legend: Rockefeller at Standard Oil, Ford at Ford, Sloan at General Motors, Firestone at Firestone, the first Watson at IBM, Sewell Avery at Montgomery Ward, Julius Greenwald at Sears, Amadeo Peter Giannini at the Bank of America, Juan Trippe at Pan Am. Such an originating name can be identified with nearly every one of the Fortune 500 or the comparison corporations in merchandising, transportation or finance.

At a second stage, sometimes, as in the case of Henry Ford, strongly resisted by the original entrepreneur, organization takes over. The requirements for decision are now too diverse for one man; any important action calls for a large range of specialized knowledge. The myth of leadership and command continues; it is heralded in the press, acknowledged in access to the corporate jet. Obeisance is even accorded a board of directors. In fact, the corporation has become a collective of its top management and its operating and technical staff. Pondering this development some years ago, I called this collective the technostructure.

What I did not then see is the tendency for the technostructure to age. Initially, as it takes over from the original entrepreneur, it can be a thing of initiative and vigor. Men (and extremely few women) are freed from the heavy hand of authority; action is no longer confined to what can be grasped by one by now somewhat stereotyped mind. In the life cycle of the corporation there can be a time of collective innovation, adventure and growth. Thus it was at Ford after Henry Ford when the young men took over after World War II. And at IBM after Watson. And at Chrysler after Walter P. Chrysler. There is danger in easy generalization here. But, clearly, the first manifestations of collective or bureaucratic control of the corporation can be affirmative, not adverse. I come now to the next stage.

Here the corporate organization—the technostructure—has a tendency, as does any large organization, public or private, to clone itself. People are promoted who most closely resemble the people who are already there. There is a concern for excellence; excellence is what most resembles those making personnel decisions. This criterion is by no means peculiar to corporations; I long ago noticed its use, including by myself, at Harvard. Top jobs are now achieved by men in their mid- or late-50s. For their few years in senior position, short-run performance rather than long-run planning and achievement is safest, most comfortable, the most agreeable career choice. This will especially be so in older process-type industry where the disturbing effects of technological change or in consumer taste do not shock the organization men into unwelcome thought.

In consequence, investment becomes cautious; analysis becomes a surrogate for action; innovation has an aspect of danger; the ability to adapt to changing circumstances dwindles; the future is sacrificed to the near present. Performance becomes increasingly mediocre—or worse. But in accordance with popular custom and obligatory corporate cliche the poor performance is attributed to the heavy hand of government bureaucracy, to inadequate incentives or to unfair competition. "The fault, dear Brutus, is not in ourselves but in the Japanese."

It is easier to affirm the fact of corporate senility than to prescribe for it. Acceptance of the idea of a corporate life cycle would help. Senescence would then be considered normal in the absence of affirmative efforts to prevent it. A convention that no one should achieve senior corporate position after the age of 40 or 45 would be useful. It is not that the young are all that more intelligent. This, naturally, I do not believe. Rather at that age there would be a much greater term of years over which they would have to prove themselves. Longer-range planning and accompanying investment would be obligatory. The present career arrangements for executives are a kindly design for bringing comfort to the aged, one that is in keeping with the whole concept of corporate senescence.

Some congressional hearings on the aging process in large corporations might usefully focus attention on the disorder. And they might ferret out from firms and business schools some useful thoughts on how to deal with it. The discussion would help end the notion that government bureaucracy is always responsible for the failings of private bureaucracy. This could even be a compassionate thing. Washington management is now being taken over by business executives. Soon they will be blamed for what ever goes wrong in private enterprise. Those terrible Republican bureaucrats! It would be a kindly act to have the blame placed where it belongs.

PRODUCT DEVELOPMENT

(By Erwin Frand)

Most of us think of investment in plant and equipment as a long-term investment in the future. Corporations proudly announce their capital expansion and expenditures in both the business and the popular press. Underlying all of these statements is the implied understanding that the company is "bullish on the future." It is confident of its position in the marketplace, its technology, and in the products it makes. Thus, it is willing to spend large sums as a backup to these claims.

However, on further analysis, I am not sure whether all of these investments are indeed investments in the future. They are investments in the future as long as they are on the drawing board and in the planning stages. However, once the purchase orders have been issued, holes have been dug, or metal has been cut, these are investments, not in the future, but, rather, in the past. At that point, all decisions are, in essence, frozen in time. It is in the company's best interests if there are no major changes in the ways of manufacturing its product, or technological breakthroughs by competitors. If a major breakthrough happens to occur shortly after the investment decision is made, the company has an agonizing decision as to whether to scrap its investment for a new technology or hope for the best with the choices they have made.

In the not too distant past, technological changes in most major industries took place slowly. Significant changes such as the telephone, the electric light bulb, advances in manufacture of automobiles, came about relatively infrequently. Product improvements and significant advances in the state of the art in any given technology occurred at relatively long intervals. Any company which chose a given moment to build a new plant, using the latest technology, had reasonable assurance that when the plant was fully depreciated (approximately 20 years by U.S. tax laws) the state of the art had not changed so significantly so as to make the plant totally non-competitive. The underlying reason for this was that the cycle of depreciation closely matched the cycle for technological innovation. Everything was in phase.

Today, that is not the case. Historically major technological breakthroughs in computing capability take place once every ten years. New techniques to manufacture almost anything, particularly with the help of microprocessors, hit the market every three to five years. New materials are developed almost daily. This means a company investing in a new plant today may see anywhere from two to four rollovers in technology before that plant is obsolete by our government standards. It is no wonder then, that other countries where a rollover of plant investment takes place at considerably shorter intervals are beginning to achieve technological advantage over us.

As I see it, there are only two logical solutions to this problem. The first is that our philosophy of capital-intensive investment in manufacturing is now archaic and obsolete. We should not invest in capital, but, rather, in technology, and manufacture our products with a minimum of fixed assets. If heavy capital investment is required, manufacture should be shipped overseas. This is what is already occurring, in effect, when we import steel and cars from Japan.

The second is to do what many people are suggesting, admit that our depreciation and capital investment laws are themselves obsolete, and that they should be more in line with the rollover in technology. The rate of technological change, not inflation, should be the determining factor in setting depreciation rates. Depreciation, as a tax deductible expense, is by definition, a govenment subsidy of business and industry. There are no natural laws as to what a depreciation cycle should be.

Therefore, the cycle should be changed to meet the needs of the times. We now live in an era, not of capital investment with slow and gradual change, but of technological investment with fast and sudden obsolescence. Our laws should thus reflect this fundamental change.

Mr. LAFALCE. If there are no further questions of this panel, we thank you and then call the next two witnesses, Frank Swain, chief counsel, Office of Advocacy, SBA, and Dr. Denis Prager, Associate Director of the Office of Science and Technology, Executive Office of the President.

TESTIMONY OF FRANK SWAIN, CHIEF COUNSEL, OFFICE OF ADVOCACY, SMALL BUSINESS ADMINISTRATION

Mr. SWAIN. Good afternoon, Mr. Chairman. I have a prepared statement which I would like to submit for the record.

Mr. LAFALCE. Without objection, so ordered.

Mr. SWAIN. I will raise a few issues with you to try to get to what I believe is the heart of the discussion here.

First of all, my thanks to the committee. This is, as you may know, my first opportunity to testify since assuming the role of chief counsel, Office of Advocacy, 6 weeks ago. Innovation is a very timely and important subject for small business, and I am pleased to be here to express my point of view on it. I think the evidence is clear that small firms are more innovative per sale dollar and per employee than larger firms. There has been allusion to several studies that have indicated that.

I would call the committee's attention specifically to a study which is just about ready for release by the Office of Advocacy, which again reiterates the fact that small firms account for a large proportion of innovation. Small business is two to three times as innovative as the rest of the economy, particularly when you regard it as a per employee or per sale dollar. The study is not quite ready for release yet. We are in the final editing stages with the contractor, but I would like to submit it to the committee as soon as it is available.

I think it is also important to note that there have been some tremendously important technological developments by small business. Not only is small business more innovative, but I think it is this sort of innovation which really drives this country ahead. Periodically, the major business magazines have a cover story about how we are falling behind on technological development or innovation. I believe that it is important to understand that small business is a genuine resource and major answer to some of this problem, not only to help prevent us from falling further behind but in fact helping to advance our national productivity. Of course it is significant that very few Federal dollars are going to small firms in the R. & D. sense.

I would like to briefly describe the chart appended to the last page of my written statement, because I think this points out in a general sense what we are talking about, the impact of S. 881. The first column is our best estimate of the total Federal R. & D. dollars by the major agencies. This includes contracts, procurement, grants, in-house research. It is a guesstimate, to be sure, because these items aren't specifically broken out.

The total at the bottom accounts for some $30 billion per year. Now the other five columns relate solely to contracts—the amount of contract outlays given to small business.

The second column is the amount of Federal R. & D. dollars that would go to small business under an SBIR program, 1 percent. The third and fourth columns reflect the current situation, the number of contracts that go to small businesses today and their dollar amounts. The fifth column reflects a situation in which you would add the 1 percent SBIR program to the dollar amounts that are already going to small business.

The final column reflects the SBIR program as a percent of the contracts. What this really means is that as previous witnesses have pointed out, not all Federal R. & D. dollars by any means go out as contracts. In the case of the Department of Defense, approximately half of them do. In the case of other agencies, much lower percentages. Therefore, the fact that the Department of Health and Human Services can show that 11 percent of its contracts went to small businesses really doesn't say that 11 percent of its R. & D. moneys went to small business. A lot of its R. & D. moneys went out in other ways, grants and so on. The final column significantly indicates the level to which various agencies would have to adjust their current record if something like a 1 percent SBIR program were to become enacted.

As you can see, and as previous witnesses have alluded to, the Department of Defense doesn't have a bad record, particularly compared to other agencies. National Science Foundation appears to have an egregious record. That is because very few of its total moneys go to profitmaking small businesses at this point. And so as you are listening to specific agencies testify this afternoon, I hope this gives you some guidance and background. They do give some moneys now to small business. We cannot track how much grant money they give to small business because apparently the records aren't available in that particular category. We can track the awards, contract awards, that go to small business. As you can see, the contract awards are approximately 8 percent of the total R. & D. dollars, but a much lower percent of the total, but when you add in grants, we feel that the percent is incalculable but certainly very low.

I think what all this points out——

Mr. **Bedell**. Mr. Chairman, I don't understand this at all, but do you want to wait until the questioning to try to clear it up?

Mr. **LaFalce**. I think we probably better wait.

Mr. **Bedell**. OK.

Mr. **Swain**. I think the point the chart makes is that a very small percentage of Federal R. & D. moneys go to small businesses. There are lots of different ways of adding up the numbers. We attempted to take a good and accurate cut. They differ from other figures.

In the final analysis, we believe the case can be made that a very small percentage of Federal R. & D. moneys go to small business. What is the significance of this other than that small businesses are innovative? At least as far as R. & D. moneys are concerned, the Federal Government is the supply side of supply side economics. The best estimates range from 40 to 50 percent as the total amount of R. & D. moneys spent in the United States per year that are supplied by the Federal Government. So when we are looking at Federal R. & D. expenditures, we are really looking at 40 to 50 percent of the total amount of expenditures in the United States on R. & D. That is why it is such a significant question for small businesses. That is why it is so unsatisfactory that such a small percentage of the Federal moneys go to that sector of the economy now. Obviously what this legislation calls for is a mechanism to bring together Federal R. & D. funds and the small business community. A mechanism has to be arrived at better than what we have now. It is going to be a good investment for the Federal Government and for the taxpayers because small businesses are very innovative and will provide good product for the money.

It will be a good way to foster innovation and to give support to those people that have the ideas that drive our Nation ahead. I think it is entirely proper to allocate more moneys to small business R. & D. given the tremendous role small business plays in the economy and, more specifically, the tremendous role small business innovation plays in industrial innovation in this Nation.

Why does it have to be done by legislation? I think the testimony of the previous witnesses stands on its own as to the various studies and recommendations that have been accomplished through the years to attempt to move this to the front burner. Still for whatever reasons it hasn't gotten to the front burner. And I think that what we are really dealing with is a bureaucratic mindset. I have not been in the bureaucracy for more than 6 weeks, so I am not the greatest expert on that. But for whatever reasons, certain procurement officials in certain agencies just don't like to deal with small businesses. In a study that the Office of Advocacy commissioned a few years ago, there is a case history of a small firm that came up with an important innovation which could not get funded through a division of the Department of Health and Human Services until it spun off a nonprofit venture. Then it was proper to fund that venture.

I think the testimony of Mr. Eastin also alluded to the fact that his backyard operation couldn't become the proper recipient of a grant, but by undertaking basically a new corporate form, he could. I think part of the reason that agencies aren't willing to deal with small businesses perhaps is just naturally human behavior. They are willing to go where they have always gone. The personalities are familiar and the institutions are familiar.

I think it is important to note that we have a lot of conversations, a lot of discussion in the public press about risk-taking, making the environment for risk-taking and profitmaking better. I think what we have to do and what this committee has to consider is how best to force a little risk-taking mentality on those Federal agencies which are funding these R. & D. programs. Small businesses are certainly willing to take the risk of developing new products. I think agencies have to be willing to take the risk of going to that sector which has proven its response and I really regret that so much of the discussion has been in terms of quotas or set-asides. Really, that is not pitching the proper point. The intent of the legislation is to provide appropriate amounts of moneys to the small business sector which certainly has a proven track record of performance in innovation. It is not a quota or social economic goal. I think when the committee considers the legislation, certainly there are many mechanical problems that have to be worked out. I think Mr. Lewis might have hit it on the head. The agencies have some legitimate concerns regarding flexibility, regarding phase-in, regarding the definition of how these moneys are obtained. But I think the challenge to your committee and the Congress is to come up with a mechanism which properly steers these moneys where they will be the best investment for the taxpayer, for the Government and the Nation.

[Mr. Swain's prepared statement and attachments follow:]

PREPARED STATEMENT OF FRANK S. SWAIN, CHIEF COUNSEL FOR ADVOCACY, SMALL BUSINESS ADMINISTRATION

Mr. Chairman and members of this subcommittee: It is a privilege and a pleasure to be here today to testify on the issue of how to best channel federal R&D monies to innovative small firms. This is my first opportunity since my confirmation as Chief Counsel to appear before a Congressional Committee and I am pleased that my first appearance can be on an important and timely issue.

Innovation, technology leadership and small business are indeed timely concerns and they have received considerable attention in the media. The Wall Street Journal, less than two weeks ago, carried two major articles on the subject in the same issue. The point of these stories confirms our own judgment and research: for many years this country led the world in innovation and, as a result, maintained a healthy position in the world economy. However, in recent decades we have lost that edge. The reasons for that decline are many. It was a combination, perhaps, of overconfidence, government policy, over-regulations, unavailability of venture capital funds, world wide economic conditions, and shifts in business philosophy. As a result there is no single solution to the problem. If we are to successfully regain our technological edge, we must analyze the various components of the problem and tackle each one methodically and efficiently.

One basic fact has been established: small business is a leading but underutilized source of innovation in this country and encouraging small business innovation normally leads to job creation. The litany of small business role is well documented. I know you are quite familiar with these facts, so I do not believe it is necessary to repeat them. However, I want to stress that we are continually updating our research in this area and the results of these updates confirm earlier studies. One new study conducted under the Advocacy research program indicates that the ratio of innovation to employment is more than twice as great in small businesses than in larger businesses. Further, National Science Foundation data has consistently suggested that the cost per R&D scientist/engineer in small firms is about one half that in large firms.

As I noted, the problem of our technological decline is multi-faceted. We have made significant headway in removing obstacles to small business innovation in several areas. The recent tax reform bill is the most important of these advances. Many of the changes in the tax code and structure will benefit small business, but particular attention was given to those firms engaged in R&D. Eligible businesses will be able to claim a credit of 25 percent for certain qualifying R&D expenses. The 96th Congress, and specifically the House Small Business Committee, made major inroads in easing regulatory barriers. The Regulatory Flexibility Act, the Equal Access to Justice Act, and especially the Patent Act Amendments, should eliminate many of the problems of government intervention that have plagued small business. I am pleased to report that the Vice President's Task Force on Regulations is continuing these efforts and that we are assisting them with their their work. In addition it should also be noted that the Office of Federal Procurement Policy in OMB has under way a variety of initiatives to change the current procurement process in ways which will favorably impact the small high technology firms. These initiatives will enhance the entry of small firms into the government market place. All are now being actively pursued by OFPP in conjunction with OMB.

Given the impressive performance on these fronts, and the record of not promoting small business in innovation, it is embarrassing to admit that the federal government has a well-documented record of not promoting small business in its R&D efforts. I have brought with me some tables which illustrate this record in detail, but let me stress that these figures cover contracts only.

The President is making substantial headway in reducing the size of the Federal budget and there is not doubt that there will be less money available for R&D. It seems logical to me, therefore, that we must get the most out of each R&D dollar.

The Small Business Innovation Research (SBIR) program is one approach to meeting the government's R&D needs and ensuring the development of technologies and products which will contribute to job creation and our economy. Any approach to our innovation problems must be consistent with an emphasis on free market philosophy, meet difficult problems of R&D programs head-on, and offer alternative programs, rather than just further quotas.

Taking the last point first, it is not enough to merely direct agencies to provide small business with a certain amount of funds. There must be an orderly, efficient process which will allow small business to compete fairly for R&D. We need a program to encourage innovation consistent with out national needs—not a procurement quota. It is no secret that over the years we have set up a set of artificial barriers that tend to inhibit small business participation in federal programs. Not only are small businesses at a disadvantage because procedures place a premium on lawyers, accountants and procurement specialists, but because Federal employees selecting sources prefer to work with the larger firms as dealing with small firms requires more patience and guidance through the administrative maze. I cannot emphasize enough that the heart of any approach to encouraging federal use of small business innovation is to establish a system which will encourage the consistent interchange of ideas between federal agencies and smaller entities. This has been a national policy goal since before the establishment of the SBA three decades ago.

We recognize that innovation is a sometimes slow, long-term process, always with deferred benefits. It is difficult for any firm to find capital for R&D and it is twice as difficult for small firms who traditionally have a more difficult time acquiring capital for any purpose, let alone for high risk efforts. Thus, we acknowledge the need for a program that fosters an environment for the linkage of private venture capital with the entrepreneur and that promotes the commercialization of a process or product.

Encouragement of the direction of research and development monies to small profit making businesses is absolutely consistent with this Administration's overall philosophy.

It is not consistent with this Administration's philosophy to have a mandatory set aside. Thus the Administration opposes that part of the legislation. I hope that the Congress can settle on an approach which achieves the goal of expanding the R&D opportunities available to small business, yet allows federal agencies adequate flexibility to met their budget and program objectives.

Fortunately, we are not walking into this effort with our eyes closed. The NSF has operated an apparently successful program for some time. When it comes time to implement any program, we will have the guidance and expertise on how, or how not, to make it work.

Those involved in innovation in the small business community have been vocal and consistent in their encouragement of federal R&D funds being more formally targeted toward small business. An Office of Advocacy Task Force on Innovation included this in their recommendations and the White House Conference on Small Business voted it as one of their top fifteen recommendations.

In summary, if we are to regain our technological edge in the world market we must make every effort to eliminate small barriers so that small businesses can participate to a greater extent in research and development. We cannot continue to acknowledge the importance of small business to innovation on one hand while ignoring the potential of the Federal R&D budget as a way of encouraging them. I am prepared to offer any assistance we can provide to make implementation possible.

TABLE 1.—IMPACT OF S. 881 ON FEDERAL R. & D. PROCUREMENT FROM SMALL BUSINESS—FISCAL YEAR 1980 FIGURES USED AS EXAMPLES

[Dollars in thousands]

Agency	Fiscal year 1980 R. & D. outlays [1]	SBIR at 1 percent of R. & D. outlays [2]	Present contracts to small business		Contracts plus SBIR [5]	SBIR as percent of contracts [6]
			Contracts in dollars [3]	Percent of contracts [4]		
Department of Defense	$13,451,000	$134,510	$681,822	7.08	$816,332	19.73
NASA	4,711,000	47,110	69,038	2.81	116,148	68.24
Department of Energy	4,682,000	46,820	140,708	9.17	187,528	33.27
Department of Health and Human Services	3,518,000	35,180	62,447	11.17	97,627	56.34
National Science Foundation	837,000	8,370	670	1.40	9,040	1,249.25
Department of Agriculture	659,000	6,590	9,578	68.21	16,168	68.80
Department of the Interior	453,000	4,530	49,581	26.90	54,111	9.14
EPA	388,000	3,880	99,307	37.89	103,187	3.91
Department of Transportation	377,000	3,770	64,275	39.41	68,045	5.87
Department of Commerce	355,000	3,550	11,827	38.04	15,377	30.02
Nuclear Regulatory Commission	179,000	1,790	2,732	15.95	4,522	65.52
Department of Labor	150,000	1,500	4,023	22.59	5,523	37.29
Veterans' Administration	132,000	1,320	1,095	28.69	2,415	120.55
Department of Education	123,000	1,230	1,771	7.82	3,001	69.45
AID	106,000	1,060	370	....	1,430	286.49
Total	30,121,000	301,210	1,199,244	8.01	1,500,454	25.12

[1] R. & D. outlays from Special Analysis K of the U.S. budget.
[2] One percent of col. 1.
[3] Only R. & D. contract actions over $10,000 are available. No grant information on R. & D. awards to small business is available.
[4] Expresses col. 3 as a percent of all R. & D. contract actions over $10,000.
[5] The sum of cols. 1 and 3 which is the total of SBIR at 1 percent and present level of small business R. & D. contracts over $10,000.
[6] The dollar amount of SBIR at 1 percent (col. 2) as a percent of present small business R. & D. contracts (col. 3).

TABLE 2.—FEDERAL R. & D. CONTRACT ACTIONS OVER $10,000: SHARE BY PERFORMER BY AGENCY, FISCAL YEAR 1980

	Total (thousands)	Small business (percent)	Large business (percent)	Nonprofits and State/Local government		
				Educational organizations (percent)	Hospitals and other nonprofits (percent)	Other State/local government (percent)
Department of Defense	$9,630,043	7.08	80.84	7.09	4.99	....
National Aeronautics and Space Administration	2,460,883	2.81	94.01	2.12	1.05	0.01
Department of Energy	1,534,138	9.17	65.37	18.41	6.65	0.40
Department of Health and Human Services	559,201	11.17	26.59	35.52	23.09	3.63
Environmental Protection Agency	262,109	37.89	43.39	2.41	15.99	0.33
Department of the Interior	184,288	26.90	18.46	18.26	4.23	32.15
Department of Transportation	163,097	39.41	39.76	4.91	9.13	6.79
National Science Foundation	47,717	1.40	12.83	61.03	24.38	0.36
Department of Housing and Urban Development	35,150	5.34	63.90	0.69	30.07	....
Department of Commerce	31,088	38.04	25.50	26.46	7.42	2.57
Department of Education	22,652	7.82	3.95	50.03	38.20	....
Federal Emergency Management Agency	18,540	26.83	14.03	3.20	13.58	42.35
Department of Labor	17,805	22.59	53.94	12.88	9.60	0.98
Nuclear Regulatory Commission	17,126	15.95	29.50	35.25	15.31	3.98
U.S. International Development Corporation	14,966	2.47	29.07	35.39	29.06	4.01
Equal Employment Opportunity Commission	14,444	6.72	2.44	47.63	0.14	43.06
Department of Agriculture	14,041	68.21	13.57	11.44	3.80	2.98
Tennessee Valley Authority	8,601	18.08	43.33	32.24	3.93	2.42
Department of Justice	5,534	48.16	33.68	1.46	16.70	....
Veterans' Administration	3,816	28.69	4.59	35.06	15.36	16.30
Consumer Product Safety Commission	2,822	11.80	37.70	5.95	29.20	15.34
Department of State	2,793	54.56	9.27	18.90	17.26	....
U.S. Arms Control and Disarmament Agency	2,666	31.77	44.90	6.79	16.54	....
Department of the Treasury	1,520	36.64	55.46	....	7.89	....

TABLE 2.—FEDERAL R. & D. CONTRACT ACTIONS OVER $10,000: SHARE BY PERFORMER BY AGENCY, FISCAL YEAR 1980—Continued

	Total (thousands)	Small business (percent)	Large business (percent)	Nonprofits and State/Local government		
				Educational organizations (percent)	Hospitals and other nonprofits (percent)	Other State/local government (percent)
Small Business Administration	1,118	44.01	3.04	52.95		
All other	5,428	56.93	15.86	10.85	15.66	0.70
Total	15,061,586	8.09	76.58	8.91	5.65	0.77

Source: Federal Procurement Data Center Special Report 604A.

TABLE 3.—FEDERAL R. & D. CONTRACT ACTIONS OVER $10,000 BY AGENCY AND PERFORMER, FISCAL YEAR 1980

[Dollars in thousands]

	Total	Small business	Large business	Nonprofits and State/Local Government		
				Educational organization	Hospitals and other nonprofits	Other State/local government
Executive Office of the President	$455	$326	$113		$16	
Department of Agriculture	14,041	9,578	1,905	$1,606	534	$418
Department of Commerce	31,088	11,827	7,928	8,225	2,308	800
Department of Defense	9,630,043	681,822	7,785,084	682,883	480,254	
Department of Education	22,652	1,771	895	11,332	8,654	
Department of Energy	1,534,138	140,708	1,002,809	282,413	102,000	6,208
Department of Health and Human Services	559,201	62,447	148,691	198,629	129,138	20,296
Department of Housing and Urban Development	35,150	1,878	22,462	241	10,569	
Department of the Interior	184,288	49,581	34,011	33,652	7,787	59,257
Department of Justice	5,534	2,665	1,864	81	924	
Department of Labor	17,805	4,023	9,604	2,294	1,709	175
Department of State	2,793	1,524	259	528	482	
Department of Transportation	163,097	64,275	64,842	8,005	14,898	11,077
Department of the Treasury	1,520	557	843		120	
ACTION	110	86			24	
Administrative Conference of the United States	128	128				
U.S. International Development Corporation	14,966	370	4,350	5,297	4,349	600
Board for International Broadcasting	13	13				
Civil Aeronautics Board	301	287	14			
Commission on Civil Rights	89	27		25	37	
Consumer Product Safety Commission	2,822	333	1,064	168	824	433
Environmental Protection Agency	262,109	99,307	113,723	6,304	41,913	862
Equal Employment Opportunity Commission	14,444	971	353	6,880	20	6,220
Federal Communications Commission	873	390	367	60	56	
Federal Election Commission	20	20				
Federal Emergency Management Agency	18,540	4,975	2,602	594	2,517	7,852
Federal Trade Commission	338	126	158	54		
General Services Administration	876	827	49			
International Communications Agency	189	140		49		
Interstate Commerce Commission	154	140		14		
National Aeronautics and Space Administration	2,460,883	69,038	2,313,550	52,256	25,801	238
National Capital Planning Commission	14	14				
National Foundation on the Arts and the Humanities	536	104		387	22	23
National Science Foundation	47,717	670	6,120	29,122	11,634	171
Nuclear Regulatory Commission	17,126	2,732	5,053	6,037	2,622	682
Office of Personnel Management	667	212			455	

TABLE 3.—FEDERAL R. & D. CONTRACT ACTIONS OVER $10,000 BY AGENCY AND PERFORMER, FISCAL YEAR 1980—Continued

[Dollars in thousands]

				Nonprofits and State/Local Government		
	Total	Small business	Large business	Educational organization	Hospitals and other nonprofits	Other State/local government
Pennsylvania Avenue Development Corporation	129	114				15
Railroad Retirement Board	390		150		240	
Securities and Exchange Commission	10		10			
Small Business Administration	1,118	492	34	592		
Smithsonian Institution	37	37				
Tennessee Valley Authority	8,601	1,555	3,727	2,773	338	208
U.S. Arms Control and Disarmament Agency	2,666	847	1,197	181	441	
Veterans' Administration	3,816	1,095	175	1,338	586	622
Water Resources Council	99	99				
Total	15,061,586	1,218,131	11,534,006	1,342,020	851,272	116,157

Source: Federal Procurement Data Center Special Report 604A.

Mr. **SWAIN**. I would be happy to answer any questions.

Mr. **LAFALCE**. Yes, let's go to questions of you right now, Mr. Swain, because you leave me a bit confused as to just where you stand, if indeed you have a stance.

Are you for or against set-asides insofar as small business is concerned in general?

Mr. **SWAIN**. I think in general, as some previous witnesses alluded to, I am philosophically very opposed to set-asides.

Mr. **LAFALCE**. So are you as Chief Counsel for Advocacy of the Small Business Administration against section 15 of the small business law which creates a small business set-aside?

Mr. **SWAIN**. No, sir, I am not.

Mr. **LAFALCE**. That set-aside you are for? Are you for or against the set-aside for small businesses in labor surplus areas?

Mr. **SWAIN**. Mr. Chairman, I never stated I was against any existing set-asides.

Mr. **LAFALCE**. So you are for some set-asides, but against other set-asides?

Mr. **SWAIN**. No, I didn't state that, sir.

Mr. **LAFALCE**. What are you stating, Mr. Swain?

Mr. **SWAIN**. I am stating it is up to the Congress to provide a mechanism to do this.

Mr. **LAFALCE**. We know that, Congress knows that. I want to know what your opinion is specifically about set-asides. Now you said philosophically you are opposed to set-asides.

Then you said you favor the small business set-aside. Then you equivocated on the labor surplus area set-aside.

And I am just, well, now, you are raising your eyebrows. I don't know what that means. Favorable expression——

Mr. **SWAIN**. It doesn't mean anything, sir.

Mr. **LAFALCE**. Now you have said something that means nothing. Now please say something.

You have done it again. Please say something that means something on this particular issue. The issue of set-asides in general.

Are you for or against the concept of set-asides?

Mr. Swain. I am against the concept of set-asides.

Mr. LaFalce. In general?

Mr. Swain. In general.

Mr. LaFalce. What about the specific small business set-aside that has been a part of the law for some years now? Are you, as Chief Counsel for Advocacy, advocating repeal of that?

Mr. Swain. Absolutely not, Mr. Chairman.

Mr. LaFalce. Why? What is the difference between that set-aside and set-asides in general?

Mr. Swain. I believe that is a program that has worked well and provides important assistance to the small business community, which is particularly deserved.

Mr. LaFalce. There are some set-aside programs that can work well?

Mr. Swain. No question about it.

Mr. LaFalce. So then, you can't be against set-aside programs in toto?

Mr. Swain. What I am saying is that when this committee is considering how to channel more moneys toward small business, my own preference would be that the mechanism that you come up with not be set-asides. I would be more than happy to work with you——

Mr. LaFalce. What would you prefer, what mechanism?

Mr. Swain. Well, I am not prepared to state what mechanisms until a specific alternative bill is before us.

Mr. LaFalce. Did the Office of Advocacy have a position last year before you were Chief Counsel?

Mr. Swain. Last year before I was Chief Counsel, there were other bills pending. I am not precisely sure what the position of the Chief Counsel was on the particular bills.

Mr. LaFalce. Did not the Office of Advocacy help draft those bills?

Mr. Swain. I am sure that your information is better than mine. According to Mr. Glover, we have had a strong role in it. I know the Office of Advocacy has played a strong role in furthering innovation through the years.

I don't know whether the Office of Advocacy helped draft those specific bills, sir.

Mr. LaFalce. The reason I am taking this stance right now, Mr. Swain, is because this does constitute your first appearance before the Congress as Chief Counsel.

It seems to me you are now making a retreat from the position previously taken by the Office of Advocacy and also it seems to me that your testimony does little more than repeat, perhaps in different words, testimony we are going to be hearing from representatives of the administration.

Aside from the issue of this particular bill, I have broader concern for the separation of powers, so to speak, that must exist between your office and the administration at large.

Mr. Swain. Well, you raise several different points which I would like to address, Mr. Chairman.

On the separation of powers argument, when the Congress established the position of Chief Counsel of the Office of Advocacy, it made it a presidential appointment under the jurisdiction of the

Small Business Administration. At the same time, by its charter, it required that the Office of Advocacy express an independent point of view.

Now, I believe that I am attempting to do that. My effectiveness in doing that cannot solely be judged on the particular testimony that I present here.

In my capacity as Chief Counsel for Advocacy as an interlocutor, if you will, between the small business community and the administration, you can be absolutely certain that I have been extraordinarily vigorous in raising my point of view to the administration on this legislation. I will continue to do so.

In order to do that effectively, I think that the position that I have taken today on this situation of set-asides, that is, one mechanism toward achieving a goal, has to be the public position that I am taking, to allow me to work within the various Federal agencies to attempt to achieve a better policy statement on behalf of small business.

I feel that is the most effective way I can do my job and I cannot be bound by what my predecessor felt was the most effective way to do his job.

Mr. LaFalce. That is a fair enough statement. Reasonable men can disagree about the approach, but I understand what you are saying, Mr. Swain.

Out of fairness to you, may I ask if your testimony had to be reviewed and approved by the Office of Management and Budget?

Mr. Swain. It was reviewed and approved by the Office of Management and Budget.

Mr. LaFalce. I thank you.

Mrs. Snowe.

Mrs. Snowe. Yes, thank you, Mr. Chairman.

Mr. Swain, I would like to ask you about the question of continued funding for the innovation centers. As you are aware, SBA implemented last year, at the direction of the Congress, to establish innovation centers. As you know, there are three innovation centers.

Now there seems to be a question about its continued funding for the three centers. I understand there may have been a center for New England. As you know, there was a study conducted, analysis, on the innovation centers and how they progressed in this last year.

The findings of the study indicated that they were very successful and that the funding should be continued. Mr. Chairman, at this point in the testimony, I would like to insert this study, if I may.

Mr. LaFalce. Without objection, so ordered.

[The assessment follows:]

An Assessment of SBA's
Innovation Center Experiment:
Findings and Recommendations

Bureau for
Policy, Planning & Budgeting

July 1981

Executive Summary

To provide the basis for an informed judgement regarding future funding of SBA's Innovation Center Experiment, this paper describes the results of an assessment of their activities.

In October 1980, SBA initiated, at the request of the Congress, an experimental project designed to assist inventors and innovators bring new products and processes to the marketplace.

Under cooperative agreements SBA funded three Innovation Centers, funding from FY 1980 appropriations totalled $716,878; agreements were signed with: The Center for Innovation in Butte, Montana ($250,000), the Golden Gate Energy Center in Sausalito, California ($243,108), and Commercial Credit Management Corporation, a subsidiary of the Control Data Corporation in Baltimore, Maryland ($223,770). Each of the organizations was to provide, as needed, such services as market research and planning, development of financial accounting systems, planning for production, purchasing, personnel, source analysis for venture capital, engineering and design consultation and prototype development and testing.

The three organizations differ in several major respects:

1. Golden Gate is focusing on renewable energy products and processes; is selecting clients almost exclusively in the San Francisco area in conjunction with our district and regional offices, and the regional office of the Department of Energy; is working closely with other Federal and state agencies; and is trying to develop a model which can be replicated for other SBA offices.

2. Commercial Credit is using the nationwide network of Control Data Business (Resource) Centers as the contact point for their services; is concentrating on "high technology" products, e.g., electronics, computers; is using a fee schedule for its services; is primarily working within the corporate structure of the Control Data Corporation; and is actively soliciting leads and referrals for new clients.

3. The Center for Innovation in Butte, Montana has been operating, primarily in Region VIII, for several years. Their major experience has involved products relevant to this area, i.e., agriculature, mining, and energy. They will be expanding their activities, with an eye toward Regions IV and V.

The differences between the Centers, e.g., fee structure, geographic concentration, type of product, and client selection procedure, formed a "natural experiment" which was intended to provide some guidance on efficient program design.

Between May 22 and June 12, an assessment was carried out. It included visits to the Centers, and interviews with their staff and a sample of clients. Telephone interviews with clients were also conducted.

This assessment can best be described as "impressionistic and judgemental" rather than "scientific and empirical." The reasons for this revolve around the short period of time of the experiment, and the high risk nature of its goals, viz., bringing technologically new products to the marketplace. The professional literature on new product development reports that a period of four to eight years is required to bring new products to the marketplace. SBA's involvement was for eight months in the lives of a few new products. Our inability to predict the success of typical small business start-ups is well-known. It is inherently much more difficult to forecast the future of a small business which is to develop, produce, market, and make a profit with a technologically new product. These two factors, time and risk, combine to produce an assessment which is primarily anecdotal rather than systematically rigorous.

The major findings of this assessment include:

- Each of the three innovation centers has provided substantial assistance to their clients. As a result of the SBA-funded interventions, there will be a greater flow of new products and processes to the marketplace. Existing small businesses will survive and expand; new small businesses will start; new inventions will be commercialized; major scientific and technological break-throughs will begin their diffusion through the U.S. economy; increases in productivity and employment can be directly attributed to the actions of the Centers.

- When users of the innovation center were asked whether this was a "good use of taxpayer money," they uniformly applauded SBA's efforts. We regularly heard that while it is legitimate for the Government to help people who need "welfare," the Government really ought to be investing more in the future growth of the economy. Since this project is perceived as trying to fit that need, its reception was enthusiastic. Center clients were not simply saying, "because you are helping me, it is a good program." Their comments seemed to be more objective, "because this is something which will help the economy, be it me or someone else, the program is a wise use of taxpayers' money." In effect, SBA is being seen as good stewards of the taxpayers' money.

- Assessing the "quality" of the innovations which are being supported is difficult. Their full economic impact is still too far in the future to adequately measure their contribution to employment and productivity growth, and the health of the small business sector. We've attempted by discussions with clients and the staff of each innovation center to estimate the likely (hoped for?) employment growth potential of several innovations. (Some of the projects are not even far enough along to make these estimates.) Additional insight as to the projects which are being supported is presented as descriptions of some of client's projects. The range of projects is wide; their potential contributions to cost reduction, energy saving, job creation, industrial development is great.

- The imposition of fees for these services is an important and positive component of the delivery system. Any future innovation center program should include a fee structure.

- The "innovation path" runs between the initial conceptualization of a new idea (the back-of-an-envelope stage) to the appearance of a new product in the marketplace. The process of following the path is rife with difficulty and full of unexpected twists and turns. Risks of failure, both the technical risk and the commercial risk, are very high. Stamina, skill, and luck are necessary, but not sufficient conditions for a successful trip. Both the Golden Gate Energy Center and Control Data have selected clients who are "relatively far along" on the innovation path. Their selection of relatively low-risk clients (low from both a technological and commercial risk standpoint) was a deliberate choice. The Center for Innovation is involved with the riskiest projects of the three Centers.

- Clearly articulated rules of accountability between all parties, viz., SBA, the Center, and the client, are important to establish. The responsibilities and measures of performance of all parties, while always open to discussion and revision, must be agreed upon. Second-guessing, while tempting, should be discouraged.

- The development of personal respect and trust between the client and the Center's staff is the single critical factor in determining the success of the intervention. This must be supported by an accurate record-keeping system for monitoring the contacts between the client and the Center. The record-keeping system will, over time, allow for careful evaluation and adjustment of the Center's activities.

The major recommendations of this report are:

A. The Innovation Center "Experiment" be continued with currently available funds, at approximately the same level.

B. The agreement with Control Data be renewed at about the same funding level. Changes in the fee structure, viz., reducing SBA's subsidy rate, will allow a larger number of clients to be served. We should also explore mechanisms to induce Control Data to accept some "high-risk" clients.

C. That the Golden Gate Energy Center's funding be continued. If we continue with Golden Gate, their criteria for the procedures for searching out clients and the selection criteria must be sharpened. Their current clientele is too "low-risk" to truly satisfy the purposes of this program. Simultaneously, we should explore with the Department of Energy's Inventor's Program an interagency agreement which would provide additional support and services to potential small business entrepreneurs who have energy-related inventions. The concentration on renewable energy technologies and energy-conservation technologies is worthwhile and should be pursued.

D. The Center for Innovation's efforts to expand their activities in both Iowa and New Mexico should be supported. They also should be encouraged to market their services in the Midwest. States like Michigan, Wisconsin, Minnesota, Indiana, Ohio, Illinois are prime targets for an Innovation Center. Much work needs to be done in helping to stimulate economic growth and jobs in these areas.

E. If any additional funds are available to support the Innovation Center Project, they should be given to the Center for Innovation. The rationale behind this is primarily that they have four years of experience servicing inventors and innovators, and we would be well-served to utilize that experience. With the passage of time, we are confident that Golden Gate and Control Data will catch up.

I. Introduction and Background

In October 1980, SBA initiated, at the request of the Congress, an experimental project designed to assist inventors and innovators to bring new products and processes to the marketplace.

Under cooperative agreements, SBA funded three Innovation Centers, funding from FY 1980 appropriations totalled $716,878; agreements were signed with: The Center for Innovation in Butte, Montana ($250,000), the Golden Gate Energy Center in Sausalito, California ($243,108), and Commercial Credit Management Corporation, a subsidiary of the Control Data Corporation in Baltimore, Maryland ($223,770). Each of the organizations provided such services as market research and planning, development of financial accounting systems, planning for production, purchasing, personnel, source analysis for venture capital, engineering and design consultation and prototype development and testing.

Major, and planned differences between the Centers existed, e.g., fee structure, geographic concentration, type of product, client selection procedure. These formed a "natural experiment" which gives us some guidance on efficient program design.

SBA has FY 1981 funds available (about $1 million) to continue this project A decision to extinguish/extend/expand this project has to be made shortly.

The purpose of this paper is to assist in that decision. The paper:

- identifies the purposes served by the Experiment
- describes each of the three Centers
- details the methodology of the assessment
- summarizes the fundings of the assessment
- offers recommendations.

II. Purposes served by the Innovation Center Experiment

A. To discover how best to serve individual inventors and innovators who want to bring their ideas to fruition and ultimately to the marketplace.

B. To test alternative delivery systems for very specialized and narrowly focused assistance. The experiment was designed to provide experience, sharpen policy issues, and minimize the risks to SBA of making bad decisions prematurely.

C. To further SBA's top management goal to assist the Agency with the development of a new image as an aggressive agency interested in stimulating basic economic growth and development.

D. To satisfy public and Congressional mandate that SBA "do something" to assist inventors and innovators to bring new products and processes to the marketplace.

III. The Experiment revolved around planned differences in several components of an Innovation Center's structure and operations. These differences are displayed in Exhibit 1.

Exhibit 1

1. Funding

Golden Gate	$243,108
Center for Innovation	$250,000
Control Data	$223,770
Total	$716,878

2. Product/Market Emphasis

Golden Gate	Renewable energy and conservation technologies; San Francisco Bay area
Center for Innovation	Old West Region (the Dakotas, Montana, Wyoming, Nebraska); agriculture, mining
Control Data	Nationwide

3. Experience/Structure

Golden Gate	A newly organized private nonprofit corporation chartered to do energy education and business development; small core staff supplemented by consultants
Center for Innovation	Operating since 1978; uses a central staff and a network of "field representatives
Control Data	A large, integrated multi-product corporation with a long history of concern for small business; CDC employees provide consulting services.

4. Services

All Centers provide a wide range of services, e.g., technical evaluations and assistance, marketing, business plan review and development, organization development, capital planning and searching.

In addition, Golden Gate was contracted to develop a manual to facilitate the replication of additional centers; the Center for Innovation was contracted to expand its activities into Utah, New Mexico, Iowa.

5. Financial Arrangements

Golden Gate	No fees paid by clients; the SBA subsidy is 100%
Center for Innovation	Deferred contingency payments, e.g., percentage of net profits or royalties
Control Data	$150 "up front" fee plus fees for specific services; SBA subsidizes 90% of fees.

6. Sources of Clients

Golden Gate	Referrals from SBA district office and Department of Energy's regional office
Center for Innovation	Existing CFI caseload; broad public information activities
Control Data	SBA and CDC referrals

IV. The Experiment was assessed by a combination of site visits and telephone interviews. The site visit schedule is displayed below.

May 22:	Control Data clients in Baltimore, Maryland and Dover, Delaware
May 26-29:	Golden Gate Energy Center staff, consultants, clients, and advisory board
June 8-12:	Center for Innovation staff and clients; Control Data staff

Telephone interviews with twelve clients of the three Centers were conducted between June 8-15.

The adequacy of the assessment can be appreciated from Exhibit 2.

Exhibit 2

Caseloads and Interviews

	SBA Assisted Clients	Interviews (Personal and Telephone)
Golden Gate	6	6
Center for Innovation	8	4
Control Data	20-30	10

Summaries of the Personal and Telephone interviews are presented as Exhibit 3. The "Summary of Client's Assessment" is based on the client's verbatum comments; the "Observations" are those of the authors of this report, Center staff, and the client.

This assessment can best be described as "impressionistic and judgemental" rather than "scientific and empirical." The reasons for this revolve around the short period of time of the experiment, and the high risk nature of its goals, viz., bringing technologically new products to the marketplace. The professional literature on new product development reports that a period of four to eight years is required to bring new products to the marketplace. SBA's involvement was for eight months in the lives of a few new products. Our inability to predict the success of typical small business start-ups is well-known. It is inherently much more difficult to forecast the future of a small business which is to develop, produce, market, and make a profit with a technologically new product. These two factors, time and risk, combine to produce an assessment which is primarily anecdotal rather than systematically rigorous.

Exhibit 3

Reports of Site Visits and Telephone Interviews

Name	Warren Industries
Contact	Carl Warren, President Dan Henson, Executive Vice President
Product	"Solarstat" - automatic lighting control device
Time with Project	3/25/81 to present
Major Services	Business plan
Estimated Cost to SBA	$4500
Summary of Clients Assessment	Received timely help; high quality and dedicated service; provided access to wider network of potential customers
Observations	Mr. Warren had exhausted all personal savings during previous two years; was ready to "toss it and walk"; sees Solarstat as base of a "non 8(a)" Minority business growing with other, already patented, new products; expects 15-30 employees within one year; NASA reports this product saves 90% of the energy needed to provide lighting
Center	Control Data

* * * * *

Exhibit 3 (cont.)

Name	
Contact	Barbara Lee
Product	"APRIL" - computerized record-keeping system for nursing home patients
Time with Project	12/9/80 to present
Major Services	Market evaluation and marketing plan
Estimated Cost to SBA	$1100
Summary of Clients Assessment	Without assistance company would be smaller; helpful service from computer-oriented company; marketing plan is source of optimistic growth forecast
Observations	Assistance served to focus efforts to market APRIL; sales have expanded and future growth identified; new product lines are under development; Ms. Lee can foresee 15-20 employees
Center	Control Data

* * * * *

Exhibit 3 (cont.)

Name	Mario DiForte
Contact	Kent-Sussex Industries J. K. Shahan, Director Mario DiForte, Product Development
Product	Several (5-10) new consumer products
Time with Project	3/12/81 to present
Major Services	Marketing Plan
Estimated Cost to SBA	—
Summary of Clients Assessment	Services will begin in mid-June; optimistic
Observations	Sheltered workshop; developing proprietary products to replace Federal grants and to stabilize and expand work force; "low tech" products
Center	Control Data

* * * * *

Exhibit 3 (cont.)

Name	Horizon Solar
Contact	Jim Garcia, President Bob Bianco, General Manager
Product	Solar Hot Water System Marketed Directly to Homeowners
Time with Project	3/81 to present
Major Services	Goals and objectives, sales forecasts, financial plan, organizational development, engineering assistance, loan package preparation
Estimated Cost to SBA	$17,000
Summary of Clients Assessment	Without assistance, firm would be smaller, less aggressive; 30% chance of survival; Golden Gate staff shared my philosophy, helped in increasing my awareness of money and people; staff is very talented
Observations	SBA loan client likely to fail; SBA didn't respond to a request for assistance; Mr. Garcia is expansive about future: 100+ employees, new products and markets; will pay for GGEC services in the future; organized local trade association; sales are running well ahead of original projections
Center	Golden Gate

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Exhibit 3 (cont.)

Name	General Resources Corporation
Contact	Pat Riley, President Tom Riley, Vice President
Product	Combustion systems which utilize waste products from firms, fisheries, food and other biological processes to produce steam and electricity
Time with Project	3/81 to present
Major Services	Engineering, Federal financial incentives for energy development
Estimated Cost to SBA	$19,000
Summary of Clients Assessment	Invaluable contribution; a rewarding experience to have GGEC staff; first involvement with Federal government -- pleasantly surprised; accelerated our work; psychological support knowing others are trying to help and voting for you; will pay a fee for service; appreciate short-term limited push
Observations	Very sophisticated entrepreneurs; didn't "need" services; potential for major impact in the marketplace, gives SBA a better reputation
Center	Golden Gate

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Exhibit 3 (cont.)

Name	Ken Heist
Contact	Ken Heist; Billings, Montana
Product	Capacitance scale; a device for determining level and distribution of weight in trucks
Time with Project	With CFI since 10/77; with SBA since 10/80
Major Services	Project development and testing
Estimated Cost to SBA	$2800
Summary of Clients Assessment	I'd still be in the idea stage without the help of some organization; funding was helpful; CFI provided real incentive
Observations	This product has great potential in industries beyond truck transportation, e.g., security, inventory control; will probably be licensed so client can return to creating other invention; a major "innovation"
Center	Center for Innovation

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Exhibit 3 (cont.)

Name	John Eastin, Dan Schwartz
Contact	Tech Engineering; Des Moines, Iowa
Time with Project	
Major Services	Product development and testing
Estimated Cost to SBA	$12,000
Summary of Clients Assessment	Very satisfied with help from CFI; money was critical at critical time; without CFI Eastin would be bankrupt and probably be back working for someone else
Observations	A major new industrial process with enormous potential; Mr. Eastin has rejected a $10 million offer from a large company; other new processes are awaiting Mr. Eastin's attention; connection with aggressive entrepreneur was a major CFI contribution; asking for SBA loan to begin large scale manufacturing
Center	Center for Innovation.

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Exhibit 3 (cont.)

Name	Doug Wicks, Gerald Lucas
Contact	Great Falls Airform; Fibertech
Product	Airgo: Fiberglass air deflector mounted on front of "straight" trucks; reduces fuel consumption
Time with Project	With CFI since 9/79; with SBA since 10/80
Major Services	Technical and market evaluation; marketing program developed and implemented; found and nurtured working relationship with active businesses
Estimated Cost to SBA	$2700
Summary of Clients Assessment	Only people who could help me were CFI; greatest thing; will save time on my next (invention) project
Observations	Will reduce gasoline cost by 10-15 percent; potential market is very large; viz, short-haul, mid-sized trucks, connecting inventor with a businessmen is an important service; will save an SBA loan
Center	Center for Innovation

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	Southwall Corporation; Brook Seawell, Vice President for Finance
Product	Window Insulation
Major Service Provided	Financing (Bonds; DOE contracts), Marketing to a larger and different sector
Client Assessment of Service	Too early to tell; don't know yet; these programs tend not to be cost effective
Other Observations	Our problems are more difficult than regular businesses
Innovation Center	Golden Gate Energy Center

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	International Power Technology (IPT); Dayo Jones?
Product	Gas Turbine with cogeneration
Major Service Provided	Locating Finance
Client Assessment of Service	Too early to tell; no problems but no contribution; program should be continued if GGEC does something
Other Observations	Company has a lot happening GGEC assistance
Innovation Center	Golden Gate Energy Center

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	Berkley Solar Group, Inc; Charles (Chip) Barnaby
Product	Computer Analysis for Energy Efficient Buildings
Major Service Provided	Marketing Survey, Business Plan
Client Assessment of Service	Fine, very competent people; better than expected; should charge a fee; assuming it happens, we will be profitable, program should be continued
Other Observations	Quality of consultants may not be as good if replicated
Innovation Center	Golden Gate Energy Center

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	Dan Lightfoot; formerly with Hot Line Solar, Inc.
Product	Solar Energy Collector
M[illegible] Service Provided	License, Patent Rights, Research
Client Assessment of Service	Fantastic, expeditors have solutions to many of his problems; saved his corporation; program should be continued because it is only way to get this type of assistance; they do a thorough job; would have given up without their help
Innovation Center	Center for Innovation

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	Electro Tech; Don Raposo
Product	Electronic Micro Processor for Home Unit
Major Service Provided	Business Plan, Marketing Survey, Technical feasibility report
Client Assessment of Service	Takes too long, didn't like or agree with report; didn't accomplish goal; didn't get all data requested; continuation of program should be based upon cost
Other Observations	
Innovation Center	Control Data Corporation

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	Time Capsule; Tom Madison
Product	Cylinder Safe
Major Service Provided	Market Survey for Product
Client Assessment of Service	Did a good job; very short; don't know where company would be without help; program should be continued
Other Observations	
Innovation Center	Control Data Croporation

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	Andromeda Company; Mr. Given
Product	Flight Instrumentation
Major Service Provided	Marketing Survey; Business Plan
Client Assessment of Service	Timeliness very poor; communication difficulty; program should be continued but stop red tape; takes too long
Other Observations	
Innovation Center	Control Data Corporation

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	Ryan Ramp Company; Tim Spiesak
Product	Off Shore Ramp
Major Service Provided	Financing
Client Assessment of Service	They haven't done anything; take too much time; not good; got shifted around and around, not sure program should be continued; never got any help
Other Observations	
Innovation Center	Control Data Corporation

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	Raymond Company; Ray Butler
Product	Smoke Detector
Major Service Provided	How to market product; evaluate technology, business plan, financing
Client Assessment of Service	Great; if not for program, would be back at square one; very far along; program should be continued country needs more R & D
Other Observations	
Innovation Center	Control Data Corporation

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	Energy Independence; Ron Ellefson
Product	Alcohol Fuel Plants for Farmers
Major Service Provided	Business Plan; Two-Year Financial Forecast; Marketing Survey
Client Assessment of Service	Cost of consultants is high; wouldn't be any worse off at this point, but later stages will help considerably; should be continued
Other Observations	
Innovation Center	Control Data Corporation

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Exhibit 3 (cont.)

TELEPHONE INTERVIEWS

Contact	Battery Systems, Inc.; Barry Weinman
Product	Electric Battery
Major Service Provided	
Client Assessment of Service	Hasn't begun yet, due to illness; no comments at all
Other Observations	
Innovation Center	Golden Gate Energy Systems

V. Findings

A. Each of the three innovation centers has provided substantial assistance to their clients. As a result of the SBA funded interventions there will be a greater flow of new products and processes to the marketplace. Existing small businesses will survive and expand; new small businesses will start; new inventions will be commercialized; major scientific and technological break throughs will begin their diffusion through the U.S. economy; increases in productivity and employment can be directly attributed to the actions of the Centers.

B. The imposition of fees for these services is an important and positive component of the delivery system. Any future innovation center program should include a fee structure. Fees serve three purposes. They act to screen frivolous clients and thus reduce the resources required to evaluate inventions. (Of course, good ideas may also be screened out if the client cannot afford the fee. This risk is minimized if a deferred payment arrangement is used, e.g., CFI.) Secondly, fees act as a measure of committment and purpose and so enhance the relationship between the Center and their clients. Finally, client fees when added to SBA funds increase the revenues of the Center and increase the absolute number of clients who can be serviced.

C. Neither SBA's district office or the Department of Energy's Regional Office were dependable sources of referrals to the Golden Gate Energy Center. The personal contacts of GGEC staff and consultants were effectively used to locate clients. SBA's district offices provided about half of Control Data's referrals. Their nation-wide, broad product emphasis is well-matched by SBA's own structure and clientele.

D. Timely, as well as frequent, personal contacts are an important ingredient of the client's perception of the quality of assistance. The development of personal respect and trust between the client and the Center's staff is the single critical factor in determining the success of the intervention. This must be supported by an accurate record-keeping system for monitoring the contacts between the client and the Center. The record-keeping system will, over time, allow for careful evaluation and adjustment of the Center's activities.

E. Clearly articulated rules of accountability between all parties, viz., SBA, the Center, and the client, are important to establish. The responsibilities and measures of performance of all parties, while always open to discussion and revision, must be agreed upon. Second-guessing, while tempting, should be discouraged.

F. The interest and experience of each Center has effected where in the "innovation path" intervention occurs. The "innovation path" runs between the initial conceptualization of a new idea (the back-of-an-envelope stage) to the appearance of a new product in the marketplace. The process of following the path is rife with difficulty and full of unexpected twists and turns. Risks of failure, both the technical risk and the commercial risk, are very high. Stamina, skill, and luck are necessary, but are not sufficient conditions for a successful trip.

Both the Golden Gate Energy Center and Control Data have selected clients who are "relatively far along" on the innovation path. Their selection of relatively low risk clients (low from both a technological and commercial risk standpoint) was a deliberate choice. Control Data has a new product line; it wants to become the "K-Mart of management consulting services"; its fees are designed to screen out high risk clients and ensure a large number of modest successes rather than a single big winner; it is using SBA's funds to see if management services can be sold to "start-up" businesses, and if new product development can be used to sell their management consulting services.

Golden Gate is a new organization which is establishing itself and feels pressure to have some "quick winners". Its strong commitment to business development is designed to cover cases of "arrested development", i.e., narrowly focused assistance targeted at overcoming a particular barrier, rather than providing business development services on an on-going basis. (This is probably related to the absence of a fee schedule, and our one-year funding committment.)

The Center for Innovation is involved with the riskiest projects of the three Centers. CFI has been in the business longer than the others; because it expects to become a self-supporting organization funded through participation with its clients it may have a long time horizon and greater risk threshold. CFI will provide funds directly to their clients to carry out specific tasks, e.g., travel money to attend a trade show to market a product.

G. The population of potential clients is very large and quite varied. SBA's problem is not whether there is a market for the services of its innovation center, but which segment(s) of the market should it select to serve. Enormous latitude is available in how to search for, and select clients. The elements which can be considered in SBA's decision include:

1. The absolute number of clients that the Agency wants to serve
2. The average cost per client that the Agency is prepared to spend
3. The length of time the Agency wants in order to show "winners"
4. The "size" of the scientific/technological breakthrough it wants to achieve
5. SBA's relative aversion for making Type I errors (refusing to support good projects) and Type II errors (supporting bad projects)
6. The desired magnitude and distribution of winners.

We can design innovation centers which concentrate and service different segments of the market.

H. Assessing the "quality" of the innovations which are being supported is difficult. Their full economic impact is still too far in the future to adequately measure their contribution to employment and productivity growth, and the health of the small business sector. We've attempted by discussions with clients and the staff of each innovation center to estimate the likely (hoped for?) employment growth potential of several innovations. (Some of the projects are not even far enough along to make these estimates.) Employment growth has been defined to mean the number of persons the product line could support in three years after the Center's intervention. Three broad categories are used: "substantial" — 50 to 100 employees "moderate" — 10 to 50 employees; and "small" — 5 to 15 employees. These data are not offered as rigorous impact statements to be used in a cost-effectiveness analysis. They are presented in Exhibit 4 to qualitatively approximate the types of projects the Centers are supporting.

Exhibit 4

Estimates of Employment Growth

Job Growth Potential	Number of Clients
substantial	10
moderate-substantial	6
moderate	15
small-moderate	2
small	10

Additional insight as to the projects which are being supported is presented in Exhibit 5 which describes some of client's projects. The range of projects is wide; their potential contributions to cost reduction, energy saving, job creation, industrial development is great.

Exhibit 5

Some Products Being Developed at SBA-Funded Innovation Centers

Golden Gate Energy Center

1. An improved flat plate solar collector for residential hot water heating. The firm is now a retailer and wholesale distributer of residential solar systems. It is expanding into the manufacturing business as well as developing a complete vertical structure from manufacturing to installation.
2. A transparent film placed between double glazed windows that enhances the insulation characteristics of windows to where energy costs (both heating and cooling) will be cut dramatically. There is high interest from both domestic and foreign window manufacturers. Orders already exceed present production capability.
3. Long life battery for electric vehicles. The basic technology is proven. Client has a new innovation that will extend the life of the battery ten times over similar batteries presently developed. This, in turn, will accelerate market entry and enhance marketing of electric vehicles. There is high interest by both domestic and foreign auto manufacturers.
4. Leasing of combustion systems using agricultural wastes as fuel. The purpose of the system will be to co-generate electricity and steam or other mechanical power. High interest for such arrangements has been exhibited in San Joaquin/Imperial Vallies of California. Power would be sold to the electrical grid. Prices being paid by utilities will allow a quick return on investment.

Center for Innovation

1. The Airgo Deflector is a fiberglass device which, when mounted on the forward area of the cargo frame of long-haul trucks, reduces aerodynamic drag, thus improving gas mileage by 15-20 percent and handling.
2. The Capacitance Scale accurately measures the load weight of vehicles by sensing the current between two metal plates. A gauge or print-out unit inside the cab provides the user with a constant indication of weight, and the scale can determine whether or not a load is properly balanced. This device may also be used to prevent pilferage.
3. The Nitrogen Solution Converter transforms anhydrous ammonia into a non-pressurized nitrogen fertilizer for on-farm use. The process has several advantages over commonly used processes: it is safer, more efficient, less costly, easier to use, and produces fertilizer in a liquid rather than gaseous form. A second generation of this invention is under consideration which would provide unlimited phosphates.
4. A simple, low-cost unit which automatically controls up to ten thermostats. It features a seven-day time clock which can be programmed to correspond with any regular schedule and a bypass switch which allows manual operation. The device saves energy, and its low cost makes it appealing to small and mid-size companies interested in economy but unable to afford sophisticated systems.

5. The Bean Thinning and Cutting Device economically and efficiently cuts bean crops while mounted on the front or rear of a tractor. The two existing models can harvest four and six rows simultaneously. The new model will be able to handle eight rows.

Control Data Corporation

1. Automatic metal cutting control device
2. Fossil fuel management system
3. Automated patient record-keeping system for nursing homes
4. Method for growing evergreen trees
5. Electronic medical stethoscope
6. Traffic signal system
7. Micro-processor for small business computer
8. Ramp to service off-shore oil rigs
9. Process to handle toxic waste
10. Electric car
11. Display photo-typesetter
12. Fire-fighting equipment.

I. SBA's image was greatly enhanced in every instance when an innovator, together with his supporting member of an innovation center approached an SBA office for assistance. Prior to this, many times innovation center clients were completely turned off by SBA — be it lending, management assistance, or any other routine service. However, when the SBA personnel became alert to the fact that an individual was part of this experiment, attention was given to the client's particular needs. Therefore, if this particular program is continued, it should be well-publicized to all SBA personnel so they are fully aware of the implications of this program and its job and wealth-creating potential. In addition, when the clients of the innovation center were asked whether this was a good use of taxpayer money, they uniformly applauded this effort. We regularly heard that while it's legitimate for the Government to help people on welfare, it really ought to be investing more in the future growth of the economy Since this project fits those needs, its reception was enthusiastic. This is not to imply that this was selfish, i.e., that the client was simply saying that because you're helping me, it is good. Rather, theirs were more objective, i.e., because this is something which will help the economy, be it me or someone else, the program is a wise use of taxpayers' money. In effect, SBA is being seen as good stewards of the taxpayers' money.

J. It is important to recognize that this effort is important and will ultimately grow in stature and in scope, and require more rules and regulations and directives. However, a large part of the program's success is due to its extemporaneous manner and the on-on-one kind of contact which is now going on. Every situation seemed to be different from every other and that maximum flexibility has to be provided for its operation. Attempt to confine this program to specific rules and regulations must be done very prudently. In other words, the success of the program was largely due to the people involved and their person-to-person contact, not due to some "bureaucratic process" which was foisted upon the individuals. Inventors are strange people; they are creative; they are imaginative; they are driven; they are terribly exploitive of themselves and of the people around them. The staff of our three innovation centers have been emminently successful in dealing with these inventors on a very personal basis. It is not clear that any career bureaucrat who satisfies the conditions set forth in their job description, and who works a regular nine-to-five day can ever successfully provide services to the kinds of inventors, innovators, small business entrepreneurs that this program is designed for.

Ultimately, each consultant who was contracted to work with a specific client has to be matched, not only in terms of their expertise with regard to the field or to the invention, but also with their personality. This point cannot be overemphasized. In several instances, such conflict has occurred and needed to be resolved by the substitution of consultants.

The services which are provided by the consultant or by the centers have to be indigenous to the region, or specific to the industry or to the kind of product or the kind of process which is under consideration. Any mismatch along this dimension will also result in a defeated program.

V. Recommendations

A. The Innovation Center "Experiment" be continued at current funding levels and be "promoted" to a "project."

B. The contract with Control Data Company be renewed at the same funding level. Discussions with the Control Data people indicate that a change in the fees schedule is warranted. Increasing the application fee from $150 to $200 is one recommendation. The second recommendation is to reduce the SBA subsidy from 90% to 50%, i.e., under this arrangement, SBA and the clients would each pay half the cost of the services. Under the new fee structure, with the current level of funding, Control Data would be able to service a larger number of clients. We also recommend that a designated sum of money, say $30-50,000 be set aside and used to service clients whose invention offers promise of a large scientific or technological breakthrough. The purpose of this set-aside is to off-set Control Data's desire to focus on relatively low-risk clients whose products are ready for commercialization.

C. That the Golden Gate Energy Center's funding be continued If we continue with Golden Gate, the criteria for the procedures for searching out clients and the selection criteria must be sharpened. Their current clientele is too "low-risk" to truly satisfy the purposes of this program. Simultaneously, we should explore with the Department of Energy's Inventor's Program an interagency agreement which would provide additional support and services to potential small business entrepreneurs who have energy-related inventions. The concentration on renewable energy technologies and energy-conservation technologies is worthwhile and should be pursued.

D. The Center for Innovation's efforts to expand their activities in both Iowa and New Mexico should be supported. They also should be encouraged to market their services in the Midwest. States like Michigan, Wisconsin, Minnesota, Indiana, Ohio, Illinois are prime targets for an Innovation Center. Much work needs to be done in helping to stimulate economic growth and jobs in these areas.

E. If any additional funds are available to support the Innovation Center Project, they should be given to the Center for Innovation. The rationale behind this is primarily that they have four years or experience servicing inventors and innovators, and we would be well-served to utilize that experience. With the passage of time, we are confident that Golden Gate and Control Data will catch up.

F. For only one more year, responsibility for maintaining, monitoring, and evaluating the Innovation Center Project should remain within the Bureau of Policy, Planning & Budgeting.

G. During the next year of the project, work should begin on developing a legislative proposal which would give SBA a clear mandate for developing a national program of assistance to inventors, innovators, and small business entrepreneurs. Where within SBA, the responsibility for Innovation Centers is an issue which will be determined as legislation is developed.

Furthermore, during the next year, SBA should become much more involved with other Federal Agencies, and other organizations which are involved in helping to stimulate innovation through the small business sector.

Mrs. **SNOWE**. I would like to have your testimony on this point, whether you plan to fund it in the future. The fiscal year is fast approaching and SBA has not obligated its funds.

Would you comment?

Mr. **SWAIN**. Congresswoman, I would certainly be happy to comment. The funding for the innovation centers, which you are inquiring about, comes out of the SBA budget.

Certainly the rationale behind the centers is one with which we fully agree and I would be more than happy to check to see what the status of that funding is.

For those agencies that have control of that funding, we would certainly support the funding and advocate it.

I would like to comment further before I give you a firm answer. It was an important concept in trying to bring together regional expertise.

Mrs. **SNOWE**. As I understand it, SBA has a lot to do with it. They make the decision as to whether or not to obligate those funds and if they don't, they revert to the Treasury.

Mr. **SWAIN**. As I say, I truthfully don't know how SBA makes that decision. I will look into it. I will look into it and find out who at SBA does and make sure our position is stated to the agency.

Mrs. **SNOWE**. As I understand it, it is SBA's money and the decision may have been made today.

Mr. **SWAIN**. I will check immediately.

Mrs. **SNOWE**. There is a lot of interest regarding the centers. Second, I would like to know if they are going to be funded. Whether or not New England would receive one.

Mr. **SWAIN**. I will be happy to check that and get that for you this afternoon.

Mrs. **SNOWE**. One other question. You may have heard Mr. Glover's testimony earlier.

Mr. **SWAIN**. Yes, I did.

Mrs. **SNOWE**. In his testimony, he mentioned the fact that former President Carter had issued a directive instructing agencies to set aside certain moneys for R. & D. In fact, even a blue ribbon committee that had been established also recommended the various agencies set aside the money.

All of those mandates and directives, even the one issued by former President Carter, were ignored. How do you propose, if we do not establish set-asides, how do you propose to change as you mentioned the bureaucratic mind set that now prevails in the Federal agencies?

Mr. **SWAIN**. First of all, I think that it is significant that you are taking a legislative approach rather than an approach based on Executive order, memoranda or directions to agencies.

I think that is the appropriate approach to take. When the Congress speaks, no matter how powerful OMB might like to think that it is, it carries a lot more weight than when the Office of Management and Budget issues a directive or has the President sign an Executive order.

There are several different options available. The administration has proposed some approach along the lines of Public Law 95–507. When you are talking about set-asides——

Mr. **LAFALCE**. If I could interrupt you, Mr. Swain, Mrs. Snowe.

Mrs. **Snowe**. Yes.

Mr. **LaFalce**. Along the lines of Public Law 95-507, why, that creates set-asides.

Mr. **Swain**. It creates a set-aside, but the key question is the mechanism to enforce the set-aside. That is why the administration and agencies frankly support that goal, in my opinion, is because there is no strong mechanism to support it, at least not as strong a mechanism as would be established in this legislation.

Mr. **LaFalce**. It also establishes, Public Law 95-507, goals to establish clearcut goals.

Are you suggesting the administration might support legislation which mandates the establishment of goals?

Mr. **Swain**. I really can't suggest anything along that one way or the other until I talk further to administration officials.

Mr. **LaFalce**. At least that is an option for us to consider?

Mr. **Swain**. I think so. The one point I wanted to make to Congresswoman Snowe, when we are talking about set-asides, it seems some degree of the agency opposition might be mooted if there were some discussion with the agencies concerning their particular problems involving definition of the budget or the flexibility of the phase-in, because I believe there is a lot of opposition, under the theory of philosophical opposition, to set-asides which is really just a justification for bureaucratic malaise.

I think if the subcommittee can solve some of the problems that particular agencies and some of their particular budget questions, then maybe a program that is more workable can be accomplished.

Mrs. **Snowe**. I just might say, Mr. Swain, that you have been on the job 6 weeks. So probably you don't share the frustration of those interested partners with the small business community.

I just would hope that eventually it would come around, but I can't see it without legislation involved here. I just think it is going to be very difficult indeed to change the minds of many who are involved and been here a long time.

So I think those who are interested in this kind of legislation within the Congress and outside of the Congress have heard it all before.

And so I just don't see what kinds of assurances you can provide from within the bureaucracy without any kind of a legislative mandate. If it has not happened before, I am not so sure it is going to happen now.

Mr. **Swain**. I agree with you in the sense I can't provide any assurances at all. What I am saying is that the question of the mechanics of the situation are ones I can't make a definitive statement on this afternoon.

Mrs. **Snowe**. Thank you, Mr. Chairman.

Mr. **LaFalce**. Mr. Bedell.

Mr. **Bedell**. Thank you, Mr. Chairman.

Mr. Swain, as one member, I was pleased with the verbal testimony you gave. If I understood your testimony, you said that it has been unsatisfactory that such a small percentage of funding to small business existed in the past and thus it is proper to allocate money to small business in the future.

Mr. **Swain**. Yes, indeed.

Mr. **Bedell**. You said you had raised your point of view on this to the administration and felt by working in that way, you could probably accomplish the most. As you raised the point of view with the administration, will you tell us what that point of view was?

Mr. **Swain**. I will tell you in a general sense, Mr. Bedell, that the point of view I raised with the administration was not the same point of view that will be testified to by the various agencies.

I believe that the agencies generally don't regard this as a terribly important subject. They regard as the first priority, retaining their own flexibility, and not as a first priority the development of the small business sector.

I believe that my first priorities are in articulating and advocating small business before the administration. Beyond that, I think I will continue to contact the administration and speak with officials of the various agencies, as well as the Executive Office of the President concerning the issues raised this afternoon with which I would be happy to work with you and your subcommittee staff.

Mr. **Bedell**. I have to assume from what you have said you do feel it is proper to allocate money to small businesses and feel they have not been getting a satisfactory proportion of funds in the past.

You tell us you have indicated your views on this bill to the administration. I would have to assume from that that the views you have communicated to the administration, since you would tend, as Chief Counsel for Advocacy, to support this legislation.

Am I correct in making that assumption?

Mr. **Swain**. I have communicated to the administration that I believe they are taking an overly timid view of the proper way to solve this problem.

Mr. **Bedell**. Is my assumption incorrect in assuming that you have tried to convince them that this——

Mr. **Swain**. Yes, indeed. I have tried to convince them that this is legislation that they should take a serious and hard look at and that it would benefit the small business community.

Mr. **Bedell**. I really appreciate your testimony tremendously, but I think there is a problem. I happen to believe the problem comes not from you frankly; I think it comes from the administration.

You have submitted your testimony to the Office of Management and Budget, as you indicated. Did they make any changes in your testimony?

Mr. **Swain**. My staff submitted the testimony. There were some suggestions on some points covered and not covered.

I really wouldn't be able to go into it any further than that.

Mr. **Bedell**. I think you are obligated to. This is a congressional hearing. My question to you is whether or not OMB made any changes in your testimony.

Are you refusing to answer that, because if you are——

Mr. **Swain**. The most significant change——

Mr. **Bedell**. Any changes in your testimony.

Mr. **Swain**. Aside from clerical, editorial, grammatical changes——

Mr. **Bedell**. That is not my question. It is pure and simple. I want to know whether or not we can have an answer.

Did OMB make any changes in the testimony you proposed to submit to this committee?

Mr. **Swain.** I am attempting to be perfectly candid with you, Congressman.

Mr. **Bedell.** Great.

Mr. **Swain.** The major change—the only change of substance—was the OMB request to insert in my testimony a specific statement that the administration opposed quotas.

That is the only change of substance they made.

Mr. **Bedell.** That is a pretty major change. I think that was read by those of us who read your testimony to say that the Office of Advocacy opposed it.

Have you read the bill that sets up your office?

Mr. **Swain.** Yes, sir.

Mr. **Bedell.** I will read to you from that bill:

> The Chief Counsel may from time to time prepare and publish such reports as he deems appropriate, not later than one year after date of enactment of this title, he shall transmit to the Congress, the President and Administration, a full report containing his findings and specific recommendations with respect to each of the functions referred to in section 202, including specific legislative proposals and recommendations for Administration or other action. Not later than six months after date of enactment of this title, he should prepare and transmit a preliminary report of his activities.
>
> The reports shall not be submitted to the Office of Management and Budget or to any other Federal agency or Executive department for any purpose prior to transmittal to the Congress and the President.

That is the legislation that we enacted. I am going to have to run over to the floor and vote. I don't think the problem is with you, Mr. Swain. I have been delighted with your testimony. I think the problem is with the administration.

Apparently the administration doesn't realize the intent of the legislation we passed here in the Congress or else they are not going to pay any attention to it. They have no right to go over your testimony and change it and add to it.

You should not be here saying what the administration feels. You should be here saying what you feel. You have clearly demonstrated what you feel. That is your job.

Our job is to see the Government operates the way we think it ought to operate. I don't know what we have to do but we have got to do something to see that you have an opportunity to perform in your job.

I intend to do everything I can to see that you do. I am sorry I have got to run or I will miss a vote. I appreciate your testimony.

I think you are going to be a good Chief Counsel for Advocacy if you just get your backbone up and stand up for small business and do the job as it was intended by the Congress.

Mr. **Swain.** I appreciate your interest, Congressman.

Mr. **Freed.** Mr. Swain, there are just one or two questions I wanted to ask you while the members are out voting. What new facts have developed to change the Office of Advocacy's past endorsement of the Small Business Innovation bill? The Office was strongly on record last year.

Mr. **Swain.** Well, I think that first of all, I have to frankly state that I am not aware of the specifics of the position that the Office of Advocacy took on record last year.

I think my role is to attempt to articulate the importance of small business. The office continues to be a strong supporter of all measures which further small business innovation.

The measure this year was judged on its own merits alone. I am attempting to be fairly candid in stating that the intent of the bill is superior; the mechanism for its execution, as several congressmen and the Chairman pointed out, may be inevitable but is a matter for discussion and debate.

We certainly will attempt to work with your staff and people in the administration to attempt to work for the best solution to this.

Mr. **Freed**. Last year, the Senate worked with the Small Business Committee to draft S. 5607. The bill was endorsed by the White House Conference on Small Business. It became one of the top 15 recommendations of the Congress.

In that case, it is clear the office played a very active role in working on or drafting the legislation.

Let me ask you one question about the table you presented on the percentage of contracts received under the SBIR program, column 6. Is that column grants awarded by the agencies for research and development?

Mr. **Swain**. Column 6 is an artificial figure. It includes the current contracts plus 1 percent of all other awards as would be called for under various sections of the pending legislation.

Mr. **Freed**. So it does not include the total research and development expenditures of the agencies? It excludes grants?

Mr. **Swain**. Well, column 6 reflects the fact that, if you took the agencies' contract actions alone and added on 1 percent of all their R. & D. activities, they would have to increase their R. & D. activities to the small business sector by the percent listed below.

Mr. **Freed**. For instance, in the Department of Health and Human Services, were grants included in there in developing the figure for the agency?

Mr. **Swain**. No, the only column in which grants are included is column 1.

Mr. **Freed**. Column 1 would include the grants.

Mr. **Swain**. It is my understanding that grant information is not currently broken out in a meaningful way. That is the reason we didn't include it.

Mr. **Freed**. When Mr. Glover testified, he included in his testimony a chart that shows R. & D. funding by agencies from fiscal year 1975 to fiscal year 1980. The last column of his chart shows the small business share as a percentage of the total R. & D. funding for fiscal year 1980. The figures we have show that small business receives a very small share. I think in the case of the Department of Health and Human Services, 1.68 percent. That is because the Department of Health and Human Services has not awarded grants to any profit-making organization or small businesses. Now with the figures that you show, can you show small business, SBIR, as a percent of the contracts, there was not an effort to include information from other total R. & D. expenditures of the agencies?

Mr. **Swain**. I am not exactly sure I follow your question. What we have attempted to do in the best statistical way is give a picture of what the R. & D. expenditures of the agencies are now and what the contract awards are which we can clearly track. My understanding is that statistics for the total fiscal year 1980 R. & D. outlays, that is, column 1, are merely an estimate and include not only grants and contracts, but in-house research. Estimates vary depending on the way you calculate them.

Mr. FREED. My question——

Mr. SWAIN. If you will allow me, I think Mr. Glover pointed out the fact that the specific numbers aren't as relevant as the trend. I certainly have no disagreement with his characterization of the trend.

Mr. FREED. Let me ask one final question on that. Would you agree that by excluding grants, by relying wholly on contracts that you may in some instances be overstating the percentage small business is receiving of R. & D. expenditures?

Mr. SWAIN. Well, I would agree that by not looking at grants, in other words, not looking at the total R. & D. picture, and looking only at contracts, you indeed have a misleading figure as to the total, or not accurate figure as to the total percentage. You have a figure as to the percentage of contracts, and that is all.

In many agencies, very significant sums of money are put out in grant form. Unfortunately, figures are not available breaking out grant totals to small business. If Mr. Glover has those figures, I would have to see them and his chart, and comment on those specifically. But the trend is clear. We can track contracts. We can't track grants. We have nothing to indicate any greater moneys are going to small businesses whether it is called a grant or whether it is called a contract.

Mr. FREED. Thank you.

Mr. LAFALCE. Mr. Swain, let me return to the general point, and that has to do with the responsibilities of your office. The President has the power to appoint, with the consent of the Senate, members of the Supreme Court. They then have independence. I think you said the President has the power to appoint you and you are to be considered independent. Now I don't know that your independence can be the same independence of the Supreme Court. Maybe it can be, though. Certainly the Supreme Court is a constitutional body as opposed to your office being a legislative body. But is there a memorandum within your office which indicates whether or not your testimony as Chief Counsel need be cleared by OMB before you testify to the Congress?

Mr. SWAIN. Is there a memorandum? I am not aware of any memorandum.

Mr. LAFALCE. All right.

Mr. SWAIN. The section of the law that Congressman Bedell quoted from clearly states that all reports are to be issued without OMB clearance. I think you get into a technical and legal issue as to whether a written statement prepared for a congressional committee is a report included under that section of the act or not.

I chose as a courtesy to the President and to the Office of Management and Budget to submit my statement to them. I believe that the statement reflects what their position is in that segment of the statement in which I clearly state that the administration opposes set-asides. I never stated in that statement that I opposed set-asides.

Mr. **LaFalce**. I understand what you are saying, but I think it is of such paramount importance that we should dwell upon it for a time, because I think it is clear that when Congress was creating your office, we wanted an office that could speak independently on the part of the small business community. Henceforth, for example, I might well have to, when I invite you to testify, ask you to make a report to my subcommittee, and then cite the section of the congressional law which binds the President, OMB, SBA, you, us, that that report should not be cleared by OMB.

I do not think you need this advice, Mr. Swain, but I do think that OMB needs this advice. The reason I went after you a bit, maybe more so than I should have earlier, was primarily to crystallize the issue of what your role should be. And that is the independent voice of the small business community of America, not the intermediary between the office of OMB and the Congress or the American public.

Mr. Swain, there was a Task Force on Innovation within the Office of Advocacy. Correct?

Mr. **Swain**. Yes, sir.

Mr. **LaFalce**. It is my understanding that they supported this legislation; that is, the task force did. It is also my understanding that task force still exists. Would you care to comment on that?

Mr. **Swain**. The task force report came out with various recommendations, and one of the recommendations was indeed support of legislation of this nature. As to whether the task force still exists, no formal letter ever went out disbanding it. That is one of those bureaucratic things. There are still people available with considerable expertise on the issue of innovation.

Mr. **LaFalce**. For the record would you please submit to this committee the report of the Task Force on Innovation, specifically those portions that make reference to SBIR type legislation?

Mr. **Swain**. Of course.

Mr. **LaFalce**. Thank you. That can conclude your remarks, Mr. Swain. We thank you very much.

[See Appendix, p. 214, for report of Task Force on Innovation.]

Mr. **LaFalce**. Now we would like to hear from Dr. Denis Prager, associate director, Office of Science and Technology, Executive Office of the President.

TESTIMONY OF DENIS PRAGER, PH. D., ASSOCIATE DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY, EXECUTIVE OFFICE OF THE PRESIDENT

Mr. **Prager**. Mr. Chairman, you have had the privilege of having discussed my testimony already with another witness. Would you like me to go through the testimony?

Mr. **LaFalce**. We will put the entire text in the record, Dr. Prager. You may proceed as you wish.

Mr. **Prager**. I am Dr. Denis J. Prager. As you noted, I am associate director of the White House Office of Science and Technology Policy. As such, I am pleased to have this opportunity to present to the subcommittee the administration's views on several bills now pending in the House—H.R. 3091, H.R. 4326, H.R. 4343, H.R. 4373—dealing with the timely subject of small business innovation.

These nearly identical bills are founded on the premise that increased innovation by small business is a key element in efforts to strengthen the American economy by enhancing the efficiency and productivity of our industrial sector. This legislation proposes to further the goal of increased small business innovation through direct Government spending arising out of Federal research and development (R. & D.) funds set aside by each Federal R. & D. agency for the support of a model small business innovation programs.

Mr. Chairman, the administration heartily supports the worthy goal of this legislation and commends the sponsors of the bills now before the subcommittee for their desire to spawn innovation among small companies. It is clear that small businesses are, by their very nature, inventive and innovative and that facilitating invention and innovation among small firms is an important aspect of our collective efforts to strengthen industrial America.

However, Mr. Chairman, as you know from previous discussions about this testimony, the administration strongly opposes the approach to this goal advocated by this legislation. That approach is direct Federal Government support of small business R. & D. through mandated set-asides. Under this approach, Federal R. & D. agencies would be directed by statute to set aside a fixed percentage of their total R. & D. budgets to support identical small business innovation research programs. Under these programs, the agencies would solicit, evaluate, and select for funding ideas determined by the agencies to be sufficiently innovative to be commercially promising.

Let me indicate why the administration feels it must oppose the approach to small business innovation embodied in this legislation. First, Mr. Chairman, we need to be quite clear on what these bills propose. If enacted, they would, through the provision of Federal funds, assist small businesses to develop, to the point of being commercially attractive, ideas the small businesses wish to develop and market. We do not see this legislation to be designed primarily to assist the Federal Government to meet its R. & D. needs. There are other, more appropriate means of attaining that objective.

Second, Mr. Chairman, on the philosophical side of our opposition, a fundamental tenet of President Reagan's economic philosophy—one which is at the very heart of his efforts to strengthen this country's industrial efficiency, productivity, and competitiveness worldwide—is a free market system as free as possible of all Government interference or direct subsidization. The Reagan administration has made clear, and has demonstrated repeatedly, its opposition to direct Federal subsidies to industry and to any Government interference in corporate decisionmaking.

Nowhere are free market mechanisms more evident, nor free market decisions more critical, than in the competitive marketplace wherein small businesses and their new ideas and products survive or perish. It is here that the market scrutiny of ideas, individuals, and companies is at its most intense, rigorous, and competitive as decisions are made concerning investment of private venture capital in new or expanding small businesses.

Mr. Chairman, I find it interesting that through 3 or 4 hours of testimony so far this morning there has not been one mention of the role of private venture capital in attaining the kinds of objectives that we are talking about. It is into this crucial decisionmaking process, Mr. Chairman, that this legislation would thrust the Federal Government, putting Federal R. & D. agencies in the position of using public tax moneys as venture capital to promote the commercial development of ideas which the Federal agencies—not the marketplace—decide are innovative and marketable.

In addition to opposition to what it considers to be inappropriate intervention of the Federal Government in the highly competitive arena of small business innovation, the administration also cannot support the mechanism which this legislation proposes for carrying out its intent.

We feel successful small business innovation is the result of timely, market-oriented, targeted R. & D. supported by private venture capital made available on the basis of decisions by marketwise investors. There is no evidence to indicate that small business innovation can be successfully stimulated to any substantial degree by means of a large, rigid, uniform Federal program—following a protracted and untimely solicitation and decisionmaking process—in which the Government injects its money and its judgment into the competitive marketplace. The National Science Foundation program on which the legislation is modeled is small compared to that envisioned by these bills, has not yet been critically evaluated, and may not be transferable to every Federal R. & D. program.

Further, Mr. Chairman, funds for the support of the small business innovation program would be provided through an arbitrary, fixed percentage—a statutory set-aside—of the major Federal R. & D. programs. By so setting aside a portion of each R. & D. agency's budget for this specified purpose, Congress is reducing the flexibility of agencies to support that research and development which most contributes to the fulfillment of their missions, regardless of the size or type of performing organization or design of the funding mechanism. Since the R. & D. missions of the agencies are decided by Congress through the authorization and appropriations process, the set-aside provisions of this legislation constitute a significant diversion of funds from the purposes originally authorized by Congress and for which appropriations were made.

As mandated in the bills currently being considered by your subcommittee, Mr. Chairman, the set-asides apply to the entire R. & D. budgets of the major Federal R. & D. agencies. As pointed out by Mr. Walgren earlier, however, a considerable portion of these budgets supports activities completely inappropriate to the purposes of this legislation. For this reason, the magnitude of the set-asides, in practice, will be multiplied severalfold when they are applied only to those funds actually available for those purposes.

Because it is the intent of these bills to provide Federal funds to stimulate small business innovation, only agency funds intended for extramural applied research and development should form the base for any mandated program. Budgets which would have to be excluded for the purposes of funding this program include those for fundamental science, science education, and research training, agency in-house research, major systems development, fabrication, and demonstration programs such as those in DOE, DOD, and

NASA—for which small businesses now successfully compete—R. & D. administration, and facilities construction. Once these costly programs are excluded for the purpose of calculating a set-aside, one can readily see the degree to which a fixed percentage of an agency's total R. & D. budget will be magnified as it is applied only to the appropriate extramural applied research and development programs.

Thus, for these philosophical as well as very pragmatic reasons, the administration finds that it must strongly oppose enactment of the bills under discussion today. We agree with the authors of these bills that stimulating small business innovation is a worthy objective. However, we believe that there are more appropriate approaches to achieving this objective. The approaches involve, primarily, providing incentives for, and removing disincentives to, increased research and development and invention and innovation.

There are a number of activities already underway which are consistent with these approaches. Patent legislation—Public Law 96-517—enacted by the Congress last year gives small businesses—as well as universities and other nonprofit institutions—the right to title on inventions made in the performance of R. & D. supported by the Federal Government. This opportunity constitutes a significant incentive for small high technology firms to become participants in Federal R. & D. programs. Not only does this benefit the Government in terms of having increased access to innovative approaches to its R. & D. objectives, but the results can also be utilized by the small business, with patent protection, to contribute to an expanding economy.

A number of the provisions of the recently enacted tax legislation may prove to be particularly beneficial to small businesses. These include the capital gains tax reduction, the substantial R. & D. tax credit, and the employee stock option provisions. Unlike the bills under consideration today, these incentives leave the key resource allocation decisions where they belong, in the hands of risk-taking entrepreneurs whose own resources are at stake when decisions are made.

Also, as you are aware, Mr. Chairman, the administration has launched a major focus on regulatory reform and relief. It is intended that a significant proportion of the benefits arising out of the reduced regulatory burden on the private sector will accrue to small businesses.

The administration is taking steps to increase the competitiveness of small business for various Federal R. & D. programs. For example, through increased emphasis on implementation of OMB Circular A-109, the administration is encouraging the use of small R. & D. firms in the conceptualization and, possibly, the late R. & D. phases of Federal agency acquisition of major systems. This approach has the potential greatly to expand the role of small high technology firms in a major area previously restricted to larger firms selected primarily on the basis of their production capabilities.

In addition, the administration is in the process of developing proposals for significantly improving the Federal procurement process on the basis of recommendations of the Commission on Government Procurement. For example, proposals are under preparation which would: (1) Significantly remove existing constraints to submission by small businesses of unsolicited proposals to Federal R. & D. agencies; (2) eliminate mandatory cost sharing and recoupment provisions under Federal R. & D. procurement programs; (3) revise Federal R. & D. procurement proposal procedures in such a way as to facilitate competition by small businesses; and (4) raise the threshold for use of simplified procurement procedures from $10,000 to $25,000, thus expanding utilization of small high technology firms by the Federal Government.

Furthermore, of particular relevance to this hearing, are efforts by the Federal R. & D. agencies to increase access by small businesses to Federal R. & D. funding programs. NSF continues to fund a limited number of small business innovation programs through the program on which the current legislation is modeled. The Defense Department is developing a similar program but with the stated purpose of attaining new products for national defense purposes. The Department of Health and Human Services has under consideration a proposal to open to competition by profitmaking firms, the extramural grants program of the National Institutes of Health—a nearly $2 billion research program previously available only to nonprofit institutions.

In closing, Mr. Chairman, I regret that the administration cannot look favorably upon these legislative proposals, the objectives of which are so laudable. However, we believe that there are numerous, more effective and appropriate means of stimulating innovation by the small businesses of this country.

That concludes my testimony. I will be pleased to answer any questions you or your colleagues may have. Thank you.

Mr. **LaFalce**. Mr. Bedell?

Mr. **Bedell**. Yes. Mr. Prager, your testimony confuses me a little bit. Do we understand that there is a certain amount of money that is going to be available, and the question is whether 1 percent of that money should be allocated to small businesses which now provide 50 percent of our innovation or not? Is that a misstatement? Do you understand this issue differently than that?

Mr. **Prager**. I am sorry. I am not sure where that came from out of my testimony.

Mr. **Bedell**. You are opposed to this legislation. Do you understand that there is a certain amount of money appropriated for governmental research efforts and that if either of these bills were enacted, it would provide that 1 to 3 percent of that money to go to small business, which now provides approximately 50 percent of all of our innovation? There is something I don't understand about it, because I can't imagine your testimony being what it is if my statement is correct.

Mr. **Prager**. There are funds authorized and appropriated through the regular congressional channels, through the regular committees in which R. & D. funds are appropriated to various Federal agencies.

Mr. **Bedell**. Right.

Mr. **Prager**. For research and development programs to fulfill their missions.

Mr. **Bedell**. All you talked about in your testimony was how it is not up to us to interfere with the free enterprise system. The point is there isn't going to be any more interference. The point is this does not involve extra expenditures. This does not involve a bigger budget deficit. It seems to us that it makes good sense if you are trying to get maximum benefit from the dollars you expend, to see that the economic sector that is providing 50 percent of all the innovation should get 1, or 2, or 3 percent of the money we spend. Now what is so crazy about our thinking. You obviously think it is crazy or you wouldn't have submitted this testimony?

Mr. **Prager**. My personal feeling is that we are confusing two things.

Mr. **Bedell**. Who is "we"?

Mr. **Prager**. The committee and myself right now.

Mr. **Bedell**. Oh, OK.

Mr. **Prager**. And other people who have discussed this. One of the things I have been trying to grapple with is how we can attain the objectives of these bills perhaps in a different way. We keep talking about getting small businesses more involved in the research and development programs of the Federal Government. That is not my perception of what this bill does. My perception of this bill is that it sets up a very specific mechanism to provide Federal venture capital funds for small businesses to do innovation. It is called an innovation bill.

Mr. **Bedell**. How do you distinguish whether the money you give to Mobil Oil, or the money you give to a small business is venture capital for one and not the other?

Mr. **Prager**. Because this bill is designed to encourage small businesses to identify innovations which they want to pursue to commercialization.

Mr. **Bedell**. No, sir, that is not the purpose of the bill.

Mr. **Prager**. That is what it reads.

Mr. **Bedell**. The purpose of this bill is to make those government agencies who are dishing out the money to give a little of it to small businesses. That is the purpose of at least the bill this person authored. If you don't see that as being the purpose of the bill, we better change the bill. Because that is the purpose, and the reason it is needed is because the Federal Government isn't doing it. And we can't get them to because big business has the money to come in here, they have the lobbyists, they have the influence in the bureaucracy and they have had it not just in this administration, but in other administrations as well. This is an effort to try to see we spend our money in the way that would seem to be the most logical way to spend taxpayer money. It certainly is not to try to provide venture capital for small business any more than it is when you supply venture capital to Mobil Oil when you give them a contract.

Mr. **Prager**. My understanding of Federal R. & D. programs is that the Congress has authorized Federal agencies to have certain mandated programs and certain missions. If it is NASA, the mission is space. If it is NIH, it is health. The agencies set up various kinds of programs, whether they be grant programs or contract programs or cooperative agreements. And they try by putting out various kinds of solicitations to get the best possible performer of that research to do the research.

Mr. **Bedell.** If I might interrupt, if you would do some investigation, I urge you to do so. I have gone out and visited with some of those people to whom this situation applies. I can tell you the Department of Energy has canceled research projects without even looking at the contract files to find out whether they were good research projects. So if you in the Office of the President are laboring under the misapprehension that this is all done very scientifically and that it isn't a political situation, I urge you to get out and come with me, if you will. We will look at some of those projects and see how they are done.

I am telling you that is not the way it is done.

Mr. **Prager.** I disagree with that absolutely and entirely.

Mr. **Bedell.** Have you been out?

Mr. **Prager.** Yes, sir, I have been in the agencies. I work with the agencies every day. I am sure I have seen as many of them as you have.

Mr. **Bedell.** Have you been to the Department of Energy to see what they are doing in regard to their small business scientific research?

Mr. **Prager.** I think you can go——

Mr. **Bedell.** I asked you a question. Have you or have you not?

Mr. **Prager.** In that agency, no, I have not.

Mr. **Bedell.** Are you going to do it?

Mr. **Prager.** I would be glad to, if you would like to accompany me.

Mr. **Bedell.** I sure would.

Mr. **Prager.** I believe we are talking about an overall attempt by the Federal R. & D. agencies to carry out their missions. I agree with the committee and with people who have backed these bills that, for various reasons the small business community has not had an opportunity to compete on a fair basis with the large universities or larger industries. It appears that that is the case.

What I am opposed to, and what the administration is opposing, is this specific bill, which is not designed, again, as far as I see, to get at that problem. If you want to get at that problem, there are many ways to do it. You can identify what those impediments are and try to get rid of them. Indeed, the administration is working on that. We have a major task force that is trying to look at all aspects of the procurement process. We are trying to increase the number of unsolicited proposals; to reduce the cost sharing and recruitment requirements; to revise proposal procedures to facilitate participation by small businesses, by raising the threshold from 10,000 to 25,000 or more for simplified procurement procedures. Looking at those ways in which—through the existing mechanisms which have proved extremely successful in terms of Federal R. & D.—we can change current research and development procedures so that small businesses have a better shake.

I believe that what we have done, though, in these bills, is to take an approach which attacks the problem through a small business innovation cycle in which we are talking about what somebody this morning labeled "procurement of innovation." I find it incredible that we are talking about procuring innovation. The Federal Government doesn't procure innovation. It doesn't procure research and development. It has research and development needs, and it sets up various kinds of mechanisms, peer review mechanisms and other mechanisms to support research and development.

If it is procurement through contracts, we are usually trying to produce a product. Usually for defense or energy, or other purposes. But what I see here is that the three-phase process which we are talking about is the process by which innovations are developed in the private sector. It is my understanding that the reason that small businesses are so successful is that they have to make it through this tremendous competitive marketplace. That is part of what I understand to be the strength of our society in terms of the private sector: We have established, and we have protected with everything we have, this free market system whereby a small business, an innovator, an entrepreneur, can take a chance, can take a risk to go out and quit whatever he is doing or perhaps get spun off by a larger company, set up a new idea, and then have to prove it in the marketplace.

The administration's feeling is that we are superimposing on that, through these bills, a Government decisionmaking process and a Government funding process, which reduces the risk a great deal and will take some of that competitiveness out. I don't think——

Mr. **Bedell**. I am afraid my time has expired. The only thing I have to say is, it just breaks my heart.

Mr. **Prager**. I thought it would. I am sorry.

Mr. **Bedell**. To think that we are a Government supposedly representing the people of America and to have you give the testimony you have just given absolutely breaks my heart. People can disagree, and that is expected. But I just can't believe that the American people would feel that your testimony represents what they want to see.

I thank you, Mr. Chairman.

Mr. **LaFalce**. Thank you. On page 4 of your testimony when you say, and I think this is the gravamen of your philosophical differences with the bill:

> It is into this crucial decision-making process, Mr. Chairman, that this legislation would thrust the Federal Government, putting Federal R. & D. agencies in the position of using public tax monies as venture capital to promote the commercial development of ideas which the Federal agencies, not the marketplace, decide are innovative and marketable.

The difficulty that I have with that statement is if that is done, it is not done by this legislation. It is the present process that does it. The present process, however, because of the institutional biases that exist, because of the basic structure of the so-called free market, has a de facto set-aside for big business. And all we are trying to do here, the Federal R. & D. agencies, of course, make the decisions as to what the Federal R. & D. monies should go for. They do it for big business and for small business. We are saying because there is such an institutional bias in favor of big business, perhaps unknowing, perhaps unwitting, but it is still there, because there is a de facto set-aside for small business, because of the fact that we believe based upon the data that we have seen, which thus far has been undisputed, perhaps you would want to dispute it, that approximately 50 percent of innovation does come from small businesses, well, then why can't we insure that of that Federal money that does go for R. & D., where the Federal Government does make the decision that it shall be spent basically for such and such purposes, that a very small percentage be set aside for small business because of the unbelievably successful track record, successful record of small businesses?

Perhaps that is too simplistic a formulation of the question. But to me it seems to beg for the answer: "Well, yes, of course."

I am afraid we are going to have to conclude this morning's testimony. I said we would break at 1:30. I remember so well the simplistic statement that President Reagan made on TV the evening before the debate on the tax bill when he was talking. And he said, "Oh, you are going to have but this and but that on this bill. But the basic issue is either you are for me or you are against me." Well, I don't like that approach at all, but if it is good enough for the President, I suppose we could use it. Insofar as the small business community is concerned, yes, you have got your "buts" and your "ifs" on this bill. But the bottom line, you are either for the small business community or you are against them.

The subcommittee adjourns until 2:15.

[Whereupon, at 1:40 p.m., the subcommittee was recessed, to reconvene at 2:15 p.m., this same day.]

AFTERNOON SESSION

Mr. LaFalce. The Subcommittee on General Oversight of the Small Business Committee will come to order and resume its sessions.

This afternoon we are going to have a panel consisting of representatives from various Federal agencies, to be followed by a representative from the Association of American Universities and National Associate of State Universities and Land Grant Colleges.

Representatives on the agency panel will be Mr. William Long, Deputy Under Secretary of Defense for Research and Engineering, Department of Defense; Admiral Stuart Evans, Associate Administrator for Procurement, National Aeronautics and Space Administration; Mr. Hilary Rauch, Director of Procurement and Assistance Management, Department of Energy; and Mr. Henry G. Kirschenmann, Deputy Assistant Secretary for Grants and Procurement, Department of Health and Human Services.

We will introduce your entire testimony, gentlemen, into the record at this point. I would call upon you to either read your testimony in full, read it in part, or summarize it as you desire, in an attempt to keep it to approximately 5 minutes, although I don't want to be rigid in that. Perhaps you could be a bit more observant than some of this morning's panelists.

With that brief introduction, we will call upon Mr. William Long of the Department of Defense.

PANEL CONSISTING OF: WILLIAM A. LONG; ADMIRAL STUART J. EVANS; HILARY RAUCH; JOHN SHEPARD; HENRY G. KIRSCHENMANN, JR.; AND WILLIAM S. ROBB

TESTIMONY OF WILLIAM A. LONG, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING, DEPARTMENT OF DEFENSE

Mr. **Long**. Thank you, Mr. Chairman.

I would like to summarize my testimony and at the conclusion offer a few observations.

I am William Long. I serve as the Deputy Under Secretary of Defense for Research and Engineering.

I welcome this opportunity to appear before your committee to explain our small business research and development program and to comment on seven bills which have as their common purpose to strengthen the role of small R. & D. firms to meet agency needs and to contribute to the growth of strengthening of the Nation's economy.

Before commenting on these bills, I would like to note that in establishing an SBIR program, one must recognize that such a program requires the placement of awards on a small business restricted set-aside basis.

We, in the Department of Defense, believe in and very strongly support the small business set-aside program as it is our thesis that the whole set-aside program is the underpinning of our entire small business and small disadvantaged business programs.

The reason I say "whole" set-aside program is that setting aside of R. & D. procurements is very different from setting aside of any other product and services requirements. For the 9 years between fiscal year 1972 and fiscal year 1980 our set-asides for all of our products and services have averaged 6.1 percent whereas R. & D. set-asides have averaged only 0.4 of 1 percent of our total prime contract awards with all U.S. business firms.

Specifically, in fiscal year 1980 we made $66.7 billion in prime contract awards. Of this amount, small business firms won a total of $13.6 billion, or 20.4 percent. On a set-aside basis, the small firms won $4.8 billion of the $13.6 billion, or 7.2 percent of the total $66.7 billion of prime contract awards.

We support the establishment of a multiagency SBIR program with the participating agencies to be designated by the President. By conducting this program——

Mr. **LaFalce**. Where are you reading from?

Mr. **Long**. It is a summary of my testimony.

Mr. **LaFalce**. All right.

Mr. **Long**. By conducting this program on a pilot basis, it will enable us to test the concept, identify what problems may be involved and determine whether to establish the program on a permanent basis.

We oppose mandatory quotas for small business R. & D. contract awards. To arbitrarily establish a mandatory quota does not assure that the best approach to solving R. & D. problems would be utilized or that we would receive the most cost effective or innovative R. & D. for our expenditures.

Such mandatory quotas would unduly restrict our ability to carry out our R. & D. mission in a way that makes sound business. Quotas based on the percentage of an agency's R. & D. budget would create a serious problem.

Much of the DOD R. & D. budget is spent for in-house R. & D. mission support. For example, the Armament Division of the Air Force Systems Command is primarily funded with R. & D. money. This includes civilian salaries and the major portion of the operation and maintenance of test ranges.

Normally goals for special placement of contracts are based on percentage of all our contract awards, contracts awarded to U.S. business firms.

However, we do not believe that any precise percentage of expenditures can be applicable to all agencies, that such an approach is unworkable and we do not believe that it is in the best interests of the Federal Government.

The proposed bill makes no distinction between the agencies which expend R. & D. funds, nor the manner in which they are spent.

The National Science Foundation (NSF) spends R. & D. funds on small-phased programs similar to the format presented in the bill. On the other hand, a very large portion of the DOD R. & D. budget is expended in the acquisition of major systems where minimal small business capability exists except in the subcontracting arena.

It is not reasonable to expect the DOD with its major systems to achieve the same percentage as other agencies who do not acquire major systems. Therefore, we do not think it is feasible to prescribe a precise percentage in legislation which would be applicable to all Government agencies.

Each agency should be permitted to establish its own goal with regard to this program. In addition to establishment of SBIR, we have concern with two other provisions of these bills.

One is the procedure which would require us to coordinate the issue of our SBIR solicitations with another agency which has no responsibility for national security or active involvement in the procurement of R. & D. products and services.

The other provision with which we have concern is the requirement to submit reports to the SBA. In this regard we believe an intragency coordinating committee should be formed to receive any reports which may be required.

These bills would also require the NSF and SBA to furnish the Administrator of the Office of Federal Procurement Policy both advice and assistance in the promulgation of regulations which would implement the proposed law.

We do not believe this provision is required but rather would result in the addition of another layer of regulations, which is not needed in order to accomplish the objectives of the bill.

The provision provides another agency with authority to issue regulations for which the agency is not staffed, involved, or responsible for procurement of R. & D. products and services.

We do not believe there is any requirement to establish separate agencywide small business R. & D. goals as such goals are already included in the small business goals we establish on an annual basis in accordance with existing law.

I would like to focus for just a moment, if I may, on some of the Department of Defense R. & D. activity in the small business arena. I believe the Department suffers somewhat because of a lack of publicity of its support of small R. & D. business firms.

I think some of the specifics of DOD activity will indicate that the Department fully supports the objectives of the legislation and these actions consistent with the objectives that this subcommittee seeks to achieve.

Awards to small business firms in the research arena in fiscal year 1979 showed a significant increase even in the face of a lowered overall research and development expenditure level. The overall DOD-wide R. & D. expenditure levels decreased to $7.5 billion in 1979 from $7.8 billion in 1978.

Nonetheless, the small business rate of participation rose in the second of those 2 years compared to the first to 6.7 percent total R. & D. expenditures from 6.1 percent. This resulted in an increase in the small business dollar awards to $502 million from $474 million.

This past year, fiscal year 1980, we had what we believed to be a good year in connection with small business R. & D., awarding to the small businesses R. & D. contracts in the amount of $584 million, with the rate of participation increasing to 7.1 percent. This increase represents the highest dollar award rate of small business R. & D. participation in the history of the Department.

It appears we will do even better this fiscal year because as of the end of the third quarter, the end of June, fiscal year 1981, our small business R. & D. awards were at $491 million, or $93 million more than they were in the comparable period June a year ago.

Of greater significance is the rate small business participation has increased from 6.3 percent to 6.9 percent during the same period. Even with what we believe to be a significant improvement in performance, we are not yet satisfied.

As you gentlemen know, we are conducting a comprehensive program to reach out to as many small R. & D. firms as possible in order to capture the benefits of their imaginative and innovative capacity.

This outreach program includes several elements:

The first is providing R. & D. procurement information to all segments of the business community.

The second consists of providing counseling to business on an individual basis, as well as at various Federal procurement conferences throughout the country.

The third is the appointment of a small business technical adviser or group of small business technical advisers who are assigned to our laboratories to provide assistance to the small R. & D. technical entrepreneurs who are seeking assistance from a technical rather than a procurement standpoint.

The fourth aspect of our outreach program is our own defense small business advanced technology [DSAT] program. I think you gentlemen have seen this book in earlier testimony that describes the program. So, I won't go into it in great detail, but this we believe is completely consistent with your objectives, which as I said we wholeheartedly support.

This program just briefly consists of three phases. In the spring of 1981, which is the first year of this program, we sent out over

30,000 of these brochures to the small business community, to trade associations, soliciting proposals from small businesses on 20 specific project areas.

The project areas were selected by the DOD agencies—the Army, the Navy, Air Force, and the Defense Advanced Research Project Agency.

An objective of phase 1 is to receive unsolicited—or to solicit proposals in one or more of these 20 specific project areas from small businesses. These proposals were due August 31.

We received over 1,000 proposals. I think the precise number is 1,103. These proposals are now being evaluated with a view to awarding 100 contracts of up to $50,000 before the end of this calendar year, the end of December.

Phase 2 of the program will commence as the small businesses perform their R. & D. analysis under their phase 1 contracts. While we are guessing a bit, we estimate that 50 percent of the phase 1 awards will go into the phase 2 contracts, the phase 2 contracts being advanced development.

So, from a base of 1,000 to 100 contracts we go to a number that we estimate to be 50 contracts for advanced development.

Phase 3 gets into the full-scale development and will lead to, in many respects we expect, commercial application. The phase 3 funding will come from the Department to the extent that it is a product the Department of Defense can use.

To the extent that phase 2 results in a commercial item or an item more properly commercially developed, it will be privately funded. I mention this only because I think it demonstrates the active support of the Department for the objectives of your legislation.

I think that DOD, looking forward as well as backward, has come a long way in working with the small business community and providing it with assistance and guidance, and particularly in this advanced technology program for small business, in getting the goods of the small business and creating a mechanism for the small business community to participate in a greater share of our requirements for R. & D. products and services.

I think it also bears noting that within the so-called initiatives on improving the acquisition process, which the Deputy Secretary of Defense announced on April 30, is an individual recognition of our need to build up our defense industrial base, our productive capacity.

We think that this is a very vital program, this advanced technology program, in connection with implementing that initiative.

In closing, let me simply say that we don't think it is appropriate to remove innovators from the R. & D. process on a goal setting basis. We are delighted to participate with the small business community on this program and on many others. We do a lot of R. & D. business with small firms. I think we have a record we can justifiably be proud of.

In closing, I simply want to commend to your committee Mrs. Leftwich, Mr. Felsher, and Mr. Tesko who run our small business activity, and whose energies have been, and will continue to be, boundless in improving the DOD process vis-a-vis the small business community, whether it is R. & D. or otherwise.

I would be happy to answer any questions that you may have.
[Mr. Long's prepared statement and attachments follow:]

PREPARED STATEMENT OF WILLIAM A. LONG, DEPUTY UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING, ACQUISITION MANAGEMENT, DEPARTMENT OF DEFENSE

Mr. Chairman and members of the committee, I am William Long, I serve as the Deputy Under Secretary of Defense for Research and Engineering, (acquisition management). I welcome this opportunity to appear before your committee to explain our small business research and development program and to comment on seven bills which have as their common purpose to strengthen the role of small R. & D. firms to meet agency needs and to contribute to the growth and strengthening of the Nation's economy. These bills are S. 881, H.R. 11, H.R. 3091, H.R. 4254, H.R. 4326, H.R. 4343, and H.R. 4373.

I have with me Mrs. Norma B. Leftwich who is the DOD Director of Small and Disadvantaged Business Utilization and Mr. Hal C. Felsher who is the Director for Small Business and Economic Utilization Policy. The Department of Defense has a small business innovation research program [SBIR] and it has just such a program as envisioned by these bills because of the personal and determined efforts of Hal Felsher.

Before commenting on these bills, I would like to note that in establishing an SBIR program, one must recognize that such a program requires the placement of awards on a small business restricted set-aside. We, in the Department of Defense, believe in and very strongly support the small business set-aside program as it is our thesis, the whole set-aside program is the underpinning of our entire small business and small disadvantaged business programs. The reason I say "whole" set-aside program is that setting aside procurements for R. & D. is radically different than setting aside any other of our product and services requirements. For the 9 years between fiscal year 1972 and fiscal year 1980 our set-asides for all of our products and services have averaged 6.1 percent whereas R. & D. set-asides have averaged only 0.4 of a percent of our total prime contract awards with all U.S. business firms. Specifically in fiscal year 1980, we made $66.7 billion in prime contract awards. Of this amount, small business firms won a total of $13.6 billion or 20.4 percent. On a set-aside basis, the small firms won $4.8 billion of the $13.6 billion or 7.2 percent of the total $66.7 billion of prime contract awards. See enclosure No. 1.

However, when one looks at the R. & D. portion of these awards the "average overall approach" changes dramatically. In fiscal year 1980, DOD awarded $8.2 billion in R. & D. prime contracts with $584 million or 7.1 percent being awarded to small business. On a set-aside basis only $58.9 million or seven-tenths of 1 percent went to small business. See enclosure No. 2.

This certainly brings forth the question, "Why?" R. & D. is different, "radically" different from everything else we procure. When we procure most all of our products and services we know fairly precisely what we need as to its size, shape, configuration, form, fit, and function. In these cases, the contracting officers play the dominant role as to the precise method of procurement; that is, will we procure on the basis of a sole source, unrestricted competition or small business set-aside. However, when we buy R. & D. in many cases, we are buying the unknown, the untried, the unheard of and in this role the engineers, and not the contracting officers, become the dominant players, and their stand is consistent—no restriction of competition. They believe, and for many R. & D. requirements I believe they are correct, that by restricting competition we may be denying ourselves the availability of the very product, service or idea we need to maintain and improve our technological superiority required to assure the protection of this Nation's security interests.

We have made a comprehensive review of these seven proposed bills and completely support their purposes to: (1) stimulate technological innovations: (2) use small businesses to meet Federal R. & D. needs; and (3) increase private sector commercialization of innovations derived from Federal R. & D. However, we oppose certain provisions in the bills designed to achieve these objectives. Let me be specific by presenting a comparison of the main features of these bills. For this purpose I will use S. 881 and show how the other bills differ from this one.

S. 881 has as its objectives to: (1) strengthen the role of small innovative firms in federally funded research and development; (2) utilize Federal research and development as a base for technological innovation to meet agency needs: and (3) contribute to the growth and strength of the Nation's economy.

Requires each Federal agency which has an R. & D. budget in excess of $100 million to expend not less than two-tenths of 1 percentum of such budget for fiscal year 1982, not less than six-tenths of 1 percentum for fiscal year 1983, and not less than 1 percentum of such budget for all subsequent fiscal years with small business concerns specifically in connection with a small business innovation research program.

Requires each Federal agency to: (1) establish an agency SBIR program; (2) determine categories of projects to be in SBIR program; (3) issue SBIR solicitations in accordance with schedule determined cooperatively with SBA; (4) receive and evaluate proposals resulting from SBIR proposals; (5) select awardees for its SBIR funding agreements; (6) administer its own SBIR agreements; (7) make progress payments to SBIR participants; and (8) make annual report on the SBIR program to the SBA. Requires each Federal agency which has a budget in excess of $20 million for any fiscal year beginning with fiscal year 1982 to establish small business R. & D. goals with such goals not being lower than fiscal year 1981 performance.

H.R. 11 title I requires each Federal agency to target 15 percent of its R. & D. budget for prime contracts to small business and 50 percent of this amount targeted to a small business innovation research program. Title II provides a tax incentive for small business while title III deals with patents and inventions.

H.R. 3091 identical with S. 881.

H.R. 4254 identical with S. 881.

H.R. 4326 requires not less than 1 percent of R. & D. budget to SBIR program in fiscal year 1982 and 2 percent thereafter.

H.R. 4343 requires not less than two-tenths of 1 percent to SBIR program in the first fiscal year, not less than six-tenths of 1 percent in the second fiscal year, not less than 1 percent in the third fiscal year, not less than 2 percent in the fourth fiscal year, and not less than 3 percent each subsequent fiscal year.

H.R. 4373 requires not less than three-tenths of 1 percent in fiscal year 1982, 1 percent in fiscal year 1983, and not less than 2 percent for all subsequent fiscal years.

Section (4)(F) of S. 881 would require each Federal agency, which has a research or research and development budget in excess of $100 million, to establish a small business innovation research [SBIR] program requiring an agency to expend not less than two-tenths of 1 percentum of fiscal year 1983, and not less than 1 percentum of budget for all subsequent fiscal years with small business concerns specifically in connection with a SBIR program. In the case of H.R. 4343 the level is raised to 3 percent.

We support the establishment of a multiagency SBIR pilot program with the participating agencies to be designated by the President. By conducting this program on a pilot basis, it will enable us to test the concept, identify what problems may be involved and determine whether to establish the program on a permanent basis.

We oppose mandatory quotas for small business R. & D. contract awards. To arbitrarily establish a mandatory quota does not assure that the best approach to solving R. & D. problems would be utilized or that we would receive the most cost-effective R. & D. for our expenditures. Such mandatory quotas would unduly restrict our ability to carry out our R. & D. mission in a way that makes sound business sense.

Quotas based on a percentage of an agency's research and development budget would create a serious problem. Much of the DOD R. & D. budget is spent for in-house R. & D. mission support. For example, the Armament Division of the Air Force Systems Command is primarily funded with R. & D. money. This includes civilian salaries and the major portion of the operation and maintenance of the test ranges. Normally, goals for special placement of contracts are based on a percentage of all other contract awards with U.S. business firms. However, we do not believe that any precise percentages of expenditures can be applicable to all agencies, is workable, or is in the best interest of the Federal Government.

The proposed bill makes no distinction between the mission of agencies which expend R. & D. funds nor the manner in which they are spent. The National Science Foundation [NSF] spends R. & D. funds on phased small dollar research programs similar to the format presented in the bill. On the other hand, a very large portion of the DOD R. & D. budget is expended acquiring major systems where minimal small business capability exists (except for subcontracting). It is not reasonable to expect the DOD, with its major systems, to achieve the same SBIR percentage as other agencies who do not acquire major systems. Therefore, we do not think it is feasible to prescribe a precise percentage in legislation which would be applicable to all Government agencies. Each agency should be permitted to establish its own goal regarding this program.

These bills require each agency to: (*a*) Establish an SBIR program; (*b*) determine categories of projects to be included in SBIR; (*c*) issue SBIR solicitations in accordance with a schedule determined cooperatively with the SBA; (*d*) receive and evaluate SBIR proposals; (*e*) select awardees for its SBIR funding agreements; (*f*) administer its own SBIR funding agreements; (*g*) make progress payments to SBIR award recipients; and (*h*) make annual report on SBIR program to SBA.

We support all of these requirements except for (*c*) and (*h*) which require us to issue SBIR solicitations in accordance with a schedule determined cooperatively with the SBA. This would require us to coordinate with another agency which has no responsibility for national security nor active involvement in the procurement of R. & D. to become directly involved in our acquisition process. Such an arrangement would result in misunderstanding, confusion, delays and therefore, adversely affect our national security efforts. Accordingly, we recommend deletion of this requirement thereby providing maximum flexibility which is required by the various federal R. & D. agencies. Further, we believe an interagency coordinating committee should be established which would receive any program reports which may be required.

These bills require agencies with R. & D. budgets in excess of $20,000,000 to establish goals for placing awards with small business firms. The DOD has established small business prime contract goals since the onset of the DOD small business program in the midfifties. All of our R. & D. activities such as the Army Development and Readiness Command, the Navy's Materiel Command and the Air Force Systems Command, have small business goals in their procurement of R. & D. There are in fact five discrete small business goals: (1) Prime contracts, (2) set-asides, (3) subcontract, (4) disadvantaged business awards which includes three subsets: Prime contract direct, subcontract and section 8(a) awards, and (5) women-owned business awards. In my judgment, we have reached the maximum number of goals which should be placed on our activities: Establishment of R. & D. goals would tend to fragment the goal setting process and not likely result in any increased awards to small R. & D. firms. Further, it should be recognized that Public Law 95-507 codified into law the small business goal setting process. This process assures that the R. & D. element of our procurement process is being goaled.

These bills require the National Science Foundation and the Small Business Administration to furnish the Administrator of the Office of Federal Procurement Policy Advice and Assistance in the promulgation of regulations which would implement the proposed law. We do not believe this provision is required as it would result in the addition of another layer of regulations which is not needed in order to accomplish the objectives of this bill. This provision provides another agency with authority to issue regulations for which the agency is not staffed, involved or responsible for the procurement of R. & D. products and services.

DOD R. & D. ACCOMPLISHMENTS

I believe we in DOD may suffer to some degree because we do not publicize our accomplishments in support of small business. In this regard, I'd like to provide some specifics as to how we help small R. & D. business firms and those firms seeking to do business with our laboratories.

Awards to small research firms in fiscal year 1979 showed a significant increase even in the face of lowered overall research and development expenditures ($7.8 billion in fiscal year 1978 to $7.5 billion in fiscal year 1979). The small business rate of participation rose from 6.1 percent in fiscal year 1978 to 6.7 percent in fiscal year 1979, which resulted in the dollars awarded to small business increasing from $474 million to $502 million. This past year, fiscal year 1980, we had another good year for small R. & D. firms when we awarded them $584 million with the rate of participation increasing to 7.1 percent. This increase also represents the highest dollar awards rate of small business R. & D. participation in the history of the DOD small business program. It appears we'll do even better this fiscal year because as of the third quarter of fiscal year 1981, our small business R. & D. awards are at $491 million or $93 million more than the $398 million awarded during the same period last year. Of even greater significance, is that the rate of small business participation has increased from 6.3 to 6.9 percent during this same period. Enclosures two through five show our detailed R. & D. performance.

I would like to point out these awards were made to U.S. small business firms and do not include awards to universities and nonprofit institutions.

Even with our significant improved performance, we are not satisfied. We are conducting a most comprehensive program to reach as many small R. & D. firms as possible in order to capture the benefits of their imaginative and innovative capability. This Outreach program includes:

(1) Providing R. & D. procurement information to all segments of the business community;

(2) Providing counseling to business persons on an individual basis as well as at Federal procurement conferences sponsored by the Members of Congress in their local constituencies;

(3) Appointment of small business technical advisors who are assigned to our laboratories and provide assistance to the small R. & D. technical entrepreneur who is seeking assistance from a technical rather than a procurement standpoint; and

(4) The fourth aspect of our Outreach program is in keeping with the objectives of these bills before the Senate and the House to establish an agency SBIR program. We wholeheartedly support this concept as we believe it is the most far-reaching initiative to bring small innovative high technology firms into the Federal Government's procurement process for R. & D. Our conviction of the soundness of the SBIR program approach is evidenced by the fact that we initiated the development of an almost identical program approximately a year ago.

Our program will be conducted in three phases: Phase I, 20 project areas (100 contracts to be awarded) awards up to $50,000; phase II, advanced development contracts awards from $100,000 to $500,000; and phase III, follow-on production awards, where appropriate and/or commercial application of the product or service developed as a result of this program. Commercial application would be funded with private venture capital.

These awards will be made by the Army, Navy, Air Force and the Defense advanced research projects agency.

We have mailed out approximately 32,000 copies of our program opportunities brochure which I provided to your committee. Approximately 5,200 of these copies were distributed in response to written and telephone requests with the remainder being distributed based on mailing lists which were provided to us by trade associations and other organizations.

Responses from small R. & D. business firms were due in by August. As of last week we received 1,073 proposals from the small business R. & D. community. We plan to make phase I awards by December 15, 1981.

There are several other aspects associated with our Outreach program which have been included as an enclosure to my statement.

I believe that all of these outreach efforts and particularly the recently established defense small business advanced technology [DESAT] program will significantly contribute to increasing our awards to small R. & D. firms and concurrently will enable us to further exploit the technical and innovative capability possessed by these small firms.

Mr. Chairman, we support the objectives and purposes of these bills but strongly recommend that they be amended to accommodate the concerns I expressed earlier in my testimony.

We understand the significance of small R. & D. firms to our national security and you may be assured we will continue to do everything possible to enhance their participation in a larger share of our contract awards.

I will be glad to answer any questions you may have.

TABLE 1.—NASA PRIME CONTRACT AWARDS BY PROGRAM—FISCAL YEAR 1980

[Dollars in thousands]

Program	Total awards	R. & D. awards	Major program continuing actions	Small business	
				Total awards	R. & D. awards
Space Shuttle	$1,895,619	$1,793,250	$1,702,867	$65,612	$42,226
Space flight operations	441,701	423,077	381,184	40,275	32,934
Expendable launch vehicles	231,066	221,281	150,050	21,814	17,869
Physics and astronomy	185,477	177,586	111,824	20,361	16,635
Planetary exploration	45,568	42,159	24,728	6,725	4,766
Life sciences	29,969	28,706	2,686	9,415	7,717
Space applications	249,099	238,524	97,281	33,714	27,578
Technology utilization	10,368	9,894	1,512	5,050	4,119
Aeronautical research and technology	342,306	266,029	122,792	101,151	50,732
Space research and technology	71,946	68,947	3,527	19,247	15,741

TABLE 1.—NASA PRIME CONTRACT AWARDS BY PROGRAM—FISCAL YEAR 1980—Continued

[Dollars in thousands]

Program	Total awards	R. & D. awards	Major program continuing actions	Small business	
				Total awards	R. & D. awards
Energy technology	98,503	94,399	47,175	11,777	9,640
Tracking and data acquisition	266,675	208,880	144,327	49,444	16,403
Total	3,868,297	3,572,732	2,789,953	384,585	246,360

Note.—Small business obtained 9.9 percent of total awards and 6.9 percent of R. & D. awards.

PRIME CONTRACT AWARDS TO BUSINESS FIRMS [1]

	Fiscal years—								
	1972	1973	1974	1975	1976	1977	1978	1979	1980
Total awards to all firms	$34,046	$32,478	$34,518	$38,213	$38,998	$47,114	$54,359	$58,544	$66,704
Total awards to small firms	$6,128	$6,672	$7,074	$7,895	$8,108	$9,535	$10,735	$12,170	$13,588
Percent to small firms	18.0	20.5	20.5	20.7	20.8	20.2	19.7	20.8	20.4
Total awards to disadvantaged business firms [2]	(3)	(3)	$19	$26	$27	$62	$216	$359	$494
Percent to disadvantaged business firms [2]	(3)	(3)	0.1	0.1	0.1	0.1	0.4	0.6	0.7
Total small business set-aside awards	$1,752	$1,890	$1,817	$2,251	$2,291	$2,890	$3,434	$4,105	$4,787
Percent to set-asides to total awards to all firms	5.1	5.8	5.3	5.9	5.9	6.1	6.3	7.0	7.2

[1] Dollars expressed in millions.
[2] Excludes awards under the 8(a) program.
[3] Identification of minority firms not started.

R. & D. AWARDS TO ALL BUSINESS FIRMS

[Dollars in millions]

Fiscal year	Total awards	Small business awards	Percent	Set-aside awards	Percent
1972	$5,168	$256	4.9	$10.6	0.2
1973	5,656	272	4.8	9.8	.2
1974	5,148	300	5.8	12.2	.2
1975	5,601	316	5.6	15.7	.3
1976 and 1977T	7,543	396	5.3	(1)	(1)
1977	7,120	389	5.5	24.1	.4
1978	7,829	474	6.1	32.5	.4
1979	7,508	502	6.7	46.6	.6
1980	8,234	584	7.1	58.9	.7

[1] Not available.

DEPARTMENT OF DEFENSE R. & D. AWARDS TO ALL BUSINESS FIRMS

[Dollars in millions]

Fiscal year	Total awards	Small business awards	Percent
1972	$5,168	$256	4.9
1973	5,656	272	4.8
1974	5,148	300	5.8
1975	5,601	316	5.6
1976 and 1977T	7,543	396	5.3
1977	7,120	389	5.5
1978	7,829	474	6.1
1979	7,508	502	6.7

DEPARTMENT OF DEFENSE R. & D. AWARDS TO ALL BUSINESS FIRMS—Continued

[Dollars in millions]

Fiscal year	Total awards	Small business awards	Percent
1980	8,234	584	7.1
3d quarter 1980	6,333	398	6.3
3d quarter 1981	7,089	491	6.9

R.D.T. & E. CONTRACT AWARDS TO SMALL BUSINESS

[Dollars in millions]

Fiscal year	Total	Percent	Research	Percent	Development	Percent	Mgmt. and Spt.	Percent
1970	$189.1	4.0	$31.0	33.3	$139.8	3.2	$18.3	5.3
1971	183.3	3.7	28.2	31.1	133.6	3.0	21.5	6.9
1972	255.6	4.9	34.6	33.7	193.8	4.0	27.2	11.0
1973	272.1	4.8	42.7	29.4	201.0	3.8	28.4	11.1
1974	300.4	5.8	40.7	26.1	223.9	4.7	35.8	13.0
1975	316.4	5.6	38.8	29.8	243.3	4.7	34.3	11.3
1976	311.4	5.2	35.7	24.6	231.9	4.2	43.8	10.7
1976 and 1977T	396.2	5.3	46.6	24.7	291.0	4.3	58.6	11.2
1977	389.1	5.5	45.2	25.3	295.9	4.5	48.0	11.1
1978	474.1	6.1	47.2	29.2	367.2	5.1	59.7	13.6
1979	502.3	6.7	65.7	48.8	387.3	6.0	49.4	5.4
1980	584.2	7.1	83.1	26.3	446.2	6.3	54.9	6.5

SMALL BUSINESS R. & D. AWARDS

[Dollars in millions]

	1973	1974	1975	1976	1977	1978	1979	1980
Army:								
Total awards	$1,285	$1,349	$1,279	$1,273	$1,506	$1,994	$1,805	$1,836
Small business awards	$107	$108	$107	$107	$70	$81	$92	$105
Small business percent	8.4	8.0	9.0	8.4	4.7	4.1	5.1	5.7
Navy:								
Total awards	$2,084	$1,700	$1,720	$2,135	$2,351	$2,369	$2,630	$2,695
Small business awards	$97	$120	$123	$123	$161	$186	$184	$206
Small business percent	4.6	7.1	7.1	5.8	6.9	7.9	7.0	7.6
Air Force:								
Total awards	$2,287	$2,099	$2,697	$2,620	$3,059	$2,940	$2,749	$3,332
Small business awards	$68	$72	$87	$81	$110	$136	$139	$173
Small business percent	3.0	3.4	3.2	3.1	3.5	4.7	5.1	5.1
Other:								
Total awards	(1)	(1)	(1)	(1)	$205	$255	$323	$370
Small business awards					$50	$69	$87	$101
Small business percent					24.3	27.1	27.0	27.3
Total:								
Total awards	$5,656	$5,148	$5,601	$6,028	$7,121	$7,829	$7,508	$8,234
Small business awards	$272	$300	$316	$311	$389	$474	$502	$584
Small business percent	4.8	5.8	5.6	5.2	5.5	6.1	6.7	7.1

[1] Figures included in Army.

DOD RESEARCH AND DEVELOPMENT OUTREACH PROGRAM

BIDDERS MAILING LIST

The DOD is involved in several actions in order to assist the small R&D firm. One is to get the "word" out to the small R&D businessperson as to how to do business with DOD, which DOD activities purchase what kinds of R&D and who small firms can contact for assistance. The key to increasing awards to small R&D firms is the assurance that an increased number of small firms can be expected to bid on DOD R&D procurements. This can be enhanced by having as many small firms as possible make application to be included in the Bidder's Mailing List of DOD procuring activities.

FEDERAL PROCUREMENT CONFERENCES

DOD is also actively engaged with the Department of Commerce in supporting the Federal Procurement Conferences which are sponsored by individual members of Congress in their local districts or states. At each of these conferences, DOD provides a senior Small Business Advisor from one of the Military Services or the Defense Logistics Agency as well as other DOD representatives from DOD activities located in the proximity of the Congressional member's constituency.

These DOD personnel provide information on how to do business with the military. Businesspersons are given copies of the booklet "Selling to the Military" which tells them what products and services each of our activities buys and what procedures must be followed to be placed on our bidders' mailing list. This publication also includes a separate section on Research and Development listing our R&D activities, what they buy, and how to prepare an unsolicited proposal. DOD also publishes a booklet listing each of our approximately 700 Small and Disadvantaged Business Specialists by their assigned procurement activity and location. These individuals not only assist businesspersons desiring to obtain procurements but more important, they screen procurements over $2,500 to determine if it can be set-aside for exclusive small business participation. Additionally, all of the Military Services distribute publications which treat their requirements in greater detail.

DOD TECHNICAL ADVISORS

A specific senior technical individual at each of the DOD laboratories has been assigned as one of his duties to help small business obtain research and development contracts. Individuals so assigned work with the small business specialists in terms of offering advice on R&D matters, such as identifying the particular engineer who is most familiar with a forthcoming R&D procurement. This is part of our continuing efforts to involve technical personnel in the small business program.

COMMERCE BUSINESS DAILY SYNOPSIS

Forthcoming procurement requirements valued in excess of $10,000 are synopsized in the Commerce Business Daily (CBD). Notices are also published of every contract award valued in excess of $100,000 which provides small firms the opportunity to compete for subcontract awards.

R. & D. INFORMATION

Th Military Services conduct advanced planning briefings for industry to inform them of what products, services or techniques will be sought in the near future. The Navy has established two NARDIC's (Navy R&D Information Center), one on each coast which includes Air Force representation. These offices make information regarding R&D planning and requirements available to small business. The Navy has also established a NICRAD (Navy/Industry Cooperative R&D) Program which furnishes scientific and technical information on the operational capabilities and requirements of the U.S. Navy to non-government activities on a cooperative, no-cost contract basis.

R. & D. SOURCES SOUGHT

It is DOD policy to utilize the R&D Sources Sought Section of the Commerce Business Daily, whenever practical, to seek additional small business sources for R&D procurements anywhere from three to six months in advance of the actual procurement. This technique is particularly helpful to small business firms. It gives them an opportunity to respond, by submitting technically qualifying information, to any synopsis in which they have an interest and a capability to satisfy.

TECHNOLOGY TRANSFER

It is the policy of the DOD to promote military-civilian technology transfer and cooperative development. This policy encompasses (1) the transfer of technology developed by DOD activities for national defense purposes to the civilian sector where such technology can be profitably utilized non-military applications, and (2) the identification of coming technologies of both military and civilian interest and the exploration of the feasibility for cooperative funding and for development of such technologies.

We accomplish this primarily through our Defense Documentation Center (DDC). DDC assists these Government contractors—and potential Defense contractors—by supplying technical reports of completed R&D efforts as well as summaries of ongoing R&D projects. These services are available to all U.S. Government activities and to their contractors, subcontractors and grantees—regardless of size.

The systematic and timely availability of these technical reports and current project summaries helps significantly to prevent or reduce unnecessary duplication of R&D project work and to accelerate the completion and application of research information in order to shorten the "concept-to-delivery" cycle.

The DDC technical document collection totals more than a million different titles, covering all areas of science and technology. Information in these reports could enhance the efforts of aerodynamicists.

Mr. **LaFalce**. Thank you very much, Mr. Long.

We will defer questions until we have heard from the other agency representatives.

We will hear now from Admiral Evans, Director of Procurement, NASA.

Admiral **Evans**. Thank you, Mr. Chairman.

Mr. **LaFalce**. Of necessity, you will summarize your remarks. We thank you for your very thorough presentation.

TESTIMONY OF ADM. STUART J. EVANS, DIRECTOR OF PROCUREMENT, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Admiral **Evans**. I am Stuart J. Evans, Director of Procurement, NASA.

We appreciate the opportunity to express NASA's views on the issue of small business innovation and proposed legislation on the same issue as set forth in, for example, S. 881, House bills 4326, 4343, and 4373. Concurrently, we wish to share with the committee our experience and results in capitalizing upon small business innovation in NASA space and aeronautical programs. A year and a half ago we were afforded a like opportunity to address a bill with similar objectives before the 96th Congress, and also participated with the National Science Foundation in exchanging views with the Committee on Science and Technology and Small Business, U.S. House of Representatives, and the then Select Small Business Committee, U.S. Senate, generally on how best to pursue objectives of the nature embodied in such bills. I believe much of what the National Science Foundation and NASA stated upon those occasions is equally relevant today with respect to certain provisions of the present bills.

We fully concur with both the findings and purposes, as quoted, and believe that NASA's actions since its inception 22 years ago amply demonstrate such concurrence. In the most recent past, our participation in studies by the Office of Federal Procurement Policy, the Department of Commerce on industrial innovation, our support and participation in the 1978 White House Conference on Small Business, and to us, most importantly, our own experience point to the conclusion that small businesses provide a vital and significant impetus not only to those fields where NASA has a direct aeronautics and space interest, but also to national technological growth. To set our activities briefly in perspective, Mr. Chairman, I wish to stress two points. First, NASA is a research and development agency engaged wholly in high technology efforts and, second, our experience and results demonstrate that the application of new technology and encouragement of innovation are vital to our mission.

Each year we tap the sector for new concepts in space and aeronautical technologies, primarily in areas where we foresee application in future NASA missions. A considerable amount of our research moneys is devoted to this purpose. The harvest we reap from ideas forthcoming basically keeps our technology advancing. While basic research efforts are not a large part of our budget, they constitute the seed money from which much research grows. It is in this area we find small business contributions and potential particularly relevant.

NASA's policies on unsolicited proposals provides still another avenue for small business to participate in the space effort. Annually, we receive and accept a significant number of unsolicited proposals from small business for pursuit of our research and technology objectives—a result we would expect from our own experience and the findings of the studies I mentioned above. We believe it is from this effort, and not from the engineering development, or major hardware fabrication, that new concepts or ideas spring. Accordingly, we have focused our efforts on small business participation in the supporting research and technology objectives of NASA.

In the past several years, one out of every four unsolicited proposals from small business has been accepted. During fiscal year 1980, for example, such proposals from small business firms constituted the highest number accepted and the largest dollar value awarded. This result is wholly consistent with our previous years' experience.

We cite the foregoing and further examples included in the complete statement to illustrate the extent of NASA's efforts and experience in fostering the objectives of these bills. They have a number of highly commendable features, some of which flow from recent studies of national industrial innovation and the level of small business contributions to it. Although we find elements to applaud in these bills, our actual experience in pursuit of the objectives leads us to conclude certain aspects of the bills might be changed to provide for pursuit of those objectives in a more flexible manner which would recognize the substantial differences in missions of the agencies to which they would apply.

There are numerous ways of reaching small business research technology communities to capitalize on this reservoir of innovation potential and fulfilling multiple agency needs and missions. These ways will vary of necessity, according to the differences and character of agency missions.

We believe NASA procurement initiatives described in our full statement offer reasonable evidence that the resources of the small business community are progressively being turned to the type of innovation research contemplated by the bills under consideration today.

Permitting procuring agencies to continue to act within longstanding procurement channels should continue to produce positive results. As I mentioned above, means are already in place for any research and development agency to obtain innovative research from small business. Certain new incentives, such as the patent rights bestowed upon small business in Public Law 96-517, offer attractive advantages to small high-technology firms to participate in the Government search for innovation.

To insure the goals of these bills are met, we would support legislation that would encourage research and development activities in agencies to undertake the types of initiatives illustrated by the NSF SBIR program appropriately adapted to their own mission. We do not believe a rigid set of predetermined statutory percentages applied to one specific type of SBIR program will aid in achieving these objectives.

We clearly endorse the objectives of these bills; however, we suggest they can be better achieved in a different manner. A bill embodying those features directing small business innovation and research and development initiatives on a pilot basis by several agencies as may be designated by the executive branch would, for instance, in our judgment, fulfill the objectives of the bills while simultaneously permitting flexibility of the mission.

Again, Mr. Chairman, I appreciate the opportunity to express our views on this.

Thank you very much.

Mr. LAFALCE. Thank you very much.

[Admiral Evans' prepared statement and attachments follow:]

PREPARED STATEMENT OF STUART J. EVANS, DIRECTOR OF PROCUREMENT, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Thank you for the opportunity to express NASA's views on the issue of small business innovation and proposed legislation on this issue as set forth in S. 881, H.R. 4326, 4343 and 4373. Concurrently, we wish to share with the Committee our experience and results in capitalizing upon small business innovation in NASA space and aeronautical programs. A year and a half ago, we were afforded a like opportunity to address a bill with similar objectives before the 96th Congress, and also participated with the National Science Foundation in exchanging views with the Committees on Science and Technology and Small Business, U.S. House of Representatives, and the then Select Small Business Committee, U.S. Senate, on how best to pursue objectives of the nature embodied in such bills. I believe much of what the National Science Foundation and NASA stated upon those occasions is equally relevant today with respect to certain provisions of the present bills. For example:

Section 2 of S. 881 and H.R. 4326 state:

"Sec. 2. (a) The Congress finds that—

(1) technological innovation creates jobs, increases productivity, competition, and economic growth, and is a valuable counterforce to inflation and the United States balance-of-payments deficit; and

(2) while small business is the principal source of significant innovations in the Nation, the vast majority of Federally funded research and development is conducted by large businesses, universities, and Government laboratories.

(b) Therefore, the purposes of this act are—

(1) to stimulate technological innovation;

(2) to use small businesses to meet Federal research and development needs; and

(3) to increase private sector commercialization of innovations derived from Federal research and development."

We concur with both the findings and purposes, as quoted, and believe that NASA's actions since its inception twenty-two years ago amply demonstrate such concurrence. In the most recent past, our participation in studies by the Office of Federal Procurement Policy (the Rabinow Panel Report of February 1977); the Department of Commerce on industrial innovation, our support and participation in the 1978 White House Conference on Small Business, and to us, most importantly, our own experience point to the conclusion that small businesses provide a vital and significant impetus not only to those fields where NASA has a direct aeronautics an space interest, but also to national technological growth.

To set our activities in perspective, Mr. Chairman, I wish to stress two points. First, NASA is a research and development agency engaged wholly in high technology efforts and, secondly, our experience and results demonstrate that the application of new technology and encouragement of innovation are integral to our mission.

Our relationship with the Nation's small business community is a prime example of growth, learning and innovation. We have attempted to promote the initiative, imagination and productivity of small business in both space and aeronautical programs.

As one result, some seven thousand small businesses worked to make the Space Shuttle and its recent flight a reality. To continue its operation at Cape Canaveral, we are completing construction of major assembly, launch, recovery and overhaul facilities—in large measure by small business.

A high technology small business is currently conducting a significant R&D effort in automotive engine technology and increasing numbers of small businesses are participating in the solar energy research we perform on behalf of DOE.

Small firms are currently involved in about 30 percent, by contract value, of the energy efforts at our Lewis Research Center. This includes work in wind energy, automotive propulsion systems and fuels, and photo-voltaic demonstration and energy storage systems.

At the Jet Propulsion Laboratory (JPL) small firms are also involved in about 30 percent of the energy programs work. This involves them in such projects as the low cost silicon solar array, electric hybrid vehicle and small power systems technology.

NASA's Marshall Space Flight Center worked directly with Department of Energy personnel in the development of building energy systems for heating and cooling. In this site demonstration effort small; firms received 35 of the 41 contracts involved, and 18 percent of the total contract value.

Within the last decade NASA has also focused considerable energy and imagination in the development of minority business opportunities throughout the Agency. Our return on this investment has been excellent, and for the fifth consecutive year, minority prime and subcontract participation has increased substantially. Here again, we are constantly seeking, and finding, new reservoirs of minority capability to tap within our programs and mission—and I expect to see continued growth in this area.

For example, we have awarded a $5.8M, eighteen month contract with a high technology 8(a) firm for major R&D support in advanced computer technology. Currently we are negotiating with this firm to provide follow-on computational capability on a new generation computer system to support the many and varied research programs at one of our research centers. This is a five year effort valued at approximately $25M.

Another 8(a) high technology firm has received two recent awards. The first is $3.5M, 2-year contract for computer services in support of the Orbiting Satellite Project, the Laboratory for High Energy Astrophysics, the Science and Applications Center, and the Laboratory for Extraterrestrial Physics. This contract contains three additional one-year options.

With the same firm, a $2.1M agreement provides for support services for the operations of the Atmospheric and Oceanic Information Processing System. The contract terms also anticipate two one-year options priced at $2.2M and $2.4M, respectively.

In mid-1978 the Administration established an Industrial Innovation Coordinating Committee under the Secretary of Commerce to address issues and problems bearing on industrial innovation. NASA has been a participant on the Committee. NASA also has embarked on a program of Joint Endeavors with U.S. domestic concerns calculated to encourage early usage of space for industrial purposes . . . initially primarily in the field of materials processing.

On June 25, 1979, NASA issued a Policy Statement of its intent to enter into transactions with U.S. domestic concerns to achieve the objective of national technological superiority through joint action. This notice described the actions/transactions NASA would undertake and set forth the types of incentives NASA would offer in these terms:

"NASA incentives for these purposes may include in addition to making available the results of NASA research: (1) providing flight time on the space transportation system on appropriate terms and conditions as determined by the Administrator; (2) providing technical advice, consultation, data, equipment and facilities to participating organizations; and (3) entering into joint research and demonstration programs where each party funds its own participation."

This notice concluded by setting forth fifteen factors NASA would consider in providing incentives including "support of socioeconomic objectives of the Government." One of the first areas that promises considerable payoff is space industrialization and, specifically, materials processing. Materials Processing in Space (MPS) is emerging as a new techological capability for materials research and for materials processes not possible on earth. The application of this technology must occur in the industrial community to satisfy the needs of an ever-expanding market for new and improved goods and services.

At this time, however, the nascent state of MPS technology places it in a long-term, high-cost, high-risk category which is generally beyond the interest and capacity of commercial concerns to pursue on a totally privately funded basis. Recognizing industry's key role in the successful innovation of any technology for commercial purposes, NASA has initiated a program effort to encourage and stimulate U.S. industry's participation in the development of MPS technology to insure that development activities reflect the needs of industry in the future.

In connection with these activities, NASA has received joint offers from three different private firms, two of which are small. One of these was consummated according to the above guidelines and the other two are in the process of negotiation. In general terms, these offers propose that the firms be responsible for ground-based experimentation and development of experiments for flight investigations and technology demonstrations, and NASA be responsible for space transportation system services and general purpose support equipment. For its participation, NASA would receive scientific and engineering data required to understand and characterize the role of gravity in material processes.

As industry and particularly small business become aware of the potentials of MPS technology, we are confident that additional Joint Endeavor offers will be forthcoming.

Each year we tap the scientific, educational and industrial sectors for new concepts and ideas in space and aeronautical technologies, primarily in areas where we foresee potential need and application in future NASA missions. A considerable amount of our basic research monies is devoted to this purpose, and the harvest we reap from the ideas forthcoming keeps our technology advancing. While basic research efforts are not a large part of our budget, they constitute the seed planting from which much innovation grows. It is in this area that we find small business contributions and potential particularly relevant.

We also expect small business to find incentives in the most recent patent statute. On July 1, 1981, NASA, along with other Federal R&D agnecies, issued new procurement regulations to implement the provisions of Public Law 96-517. This new legislation provides small business firms and nonprofit organizations the opportunity to retain title to inventions developed under contract to NASA. We believe that this effort will further stimulate innovative pursuits of small businesses engaged in research and development activities, and will also encourage the secondary use and commercialization of advanced technology in the U.S. economy.

NASA's policies on unsolicited proposals provide still another avenue for small business to participate in the space effort. Annually we receive and accept a significant number of unsolicited proposals from small business for pursuit of our research and technology objectives . . . a result we would expect from our own experience and the findings of the studies cited above. We believe it is from this effort and not engineering development or major hardware fabrication that new concepts or ideas spring. Accordingly, we have focused our efforts on small business participation in the supporting research and technology objectives of NASA.

In the past several years, one out of every four unsolicited proposals from small business has been accepted. During Fiscal Year 1980 for example, such proposals from small business firms constituted the highest number accepted and the largest dollar value awarded. This result is wholly consistent with our previous years' experience.

Let me now, Mr. Chairman, address the subject of technology transfer and the commercial application of NASA developed innovation—which is one of the three purposes of the Act set forth in Sec. 2(b).

Under its Congressional mandate to provide the widest practicable and appropriate dissemination of the results of aerospace R&D, NASA operates a variety of dissemination and transfer programs designed to encourage the secondary use of its technology in the commercial sector. Among these transfer mechanisms is a network of applications centers to provide information retrieval services and technical assistance to industrial and Government clients. The network consists of seven Industrial Applications Center (IAC) and two State Technology Applications Centers (STAC) located at university campuses across the country. The centers are backed by off-site representatives in many major cities and by technology coordinators at

NASA field centers; the latter seek to match ongoing NASA research and engineering with client interests.

The STAC's facilitate technology transfer to state and local governments, as well as to private industry, by working with existing state mechanisms for providing technical assistance. The STAC's perform services similar to those of the IAC's, but where the IAC operates on a regional basis, the STAC works within an individual state.

Additionally, NASA is initiating contacts with the Small Business Administration to investigate other possible mechanisms whereby the NASA Industrial Applications Center network can beneficially cooperate in the promotion of small business access to NASA technologies in less developed regions. While seeking additional approaches in serving the small business community, we are continuing a joint program with SBA initiated four years ago as a means of creating an awareness of the value of aerospace technology to commercial enterprises in small business firms. Four (4) of NASA's applications centers in Connecticut, Oklahoma, Indiana, and California, have been jointly funded by NASA and SBA to provide one-time problem-oriented retrospective searches of the NASA data bank to small business firms. To date, over 3,000 small business firms have been serviced by the participating NASA Industrial Applications Centers in their areas of commercial interest and speciality. A number of companies served have reported economic benefits and cost savings received through this service, and have invested in continuation of these services with the IAC in their region.

In addition to the ongoing services available through STAC's and IAC's, NASA has undertaken other projects to reach small business. For example, a regional Small Business Workshop was held October 8, 1980, at the NASA Langley Research Center, Hampton, Virginia. Attended by 125 small business executives, the workshop laboratory and fabrication facilities briefings and demonstrations covered manufacturing and fabrication techniques and concepts which are adaptable to the small manufacturing business sector. As time and funding will allow, NASA plans to hold additional workshops for small business manufacturers at other NASA centers in the future.

An example of the technical assistance provided small business firms by NASA's Industrial Applications Centers in a research task performed for the National Perforating Corporation (NPC) of Clinton, Massachusetts. NPC, a member of the Industrial Perforators Association (IPA), is a supplier of perforated metals, plastics and other materials for screens, walkways, and other products used in a wide variety of industrial applications. The company sought to determine the safe loading of such perforated products. Unable to find the needed information, the company was considering the conduct of a study which would have entailed considerable expense.

Before going ahead with the study, the company requested assistance from NASA's New England Research Applications Center (NERAC) at the University of Connecticut. NERAC conducted an extensive computer search and supplied NPC and information package, including identification of a firm which had already accomplished substantial study, test and evaluation of the strengths of perforated materials. NPC secured the information from the firm at a fraction of what a new study would have cost—with a bonus in timesaving. The NERAC study also provided NPC and the IPA with additional information about perforated materials in such areas as flow of gases and liquids over and through perforated plates, acoustical applications and filtration. Assistance provided by NERAC will be shared among IPA's other member companies.

In our efforts to trace aerospace technologies and their secondary use in industry, we often learn of small manufacturers who have spun off commercial products and processes based on work originally done for NASA. In one such example, the Ferrofluidics Corporation, a small business firm in Nashua, N.H., spawned what will probably become a whole new industry based on ferrofluids-magnetic liquids whose unusual properties offer unique advantages in a wide range of industrial applications.

Ferrofluids had their genesis in the early days of the U.S. space program. NASA faced a problem: how to feed fuel to the engine of an orbiting spacecraft when the fuel—like everything else in orbit—is weightless. A scientist at Lewis Research Center hit upon the idea of imparting magnetic properties to the fuel by dispersing within it finely ground iron oxide particles; the fuel could then be drawn into the engine by a magnetic source. Ultimately, NASA solved the problem by a different approach and ferrofluid research was shelved for the moment—but the Lewis investigations had planted the seed of a new technology.

The delay for introducing ferrofluid technology was short-lived. Two scientists from the AVCO Space Systems Division who became knowledgeable of ferrofluids, left AVCO in 1969 to form the Ferrofluidics Corporation. Armed with a license for the NASA technology, they set about to find problems to which this unique technology might apply. Over the past decade, the company has found numerous applications of ferrofluids—the first application related to the manufacture of semiconductor "chips" for use in electronic systems. The resultant product, a ferrofluidic magnetic seal, was then applied to computer disc drives and inertia dampers for stepper motors. In recent years, ferrofluidics have grown in acceptance throughout industry in a variety of industrial processes, analytical instrumentation, medical equipment, silicon crystal growing furnaces, plasma processes, fusion research, visual displays and automated machine tools.

From a sales volume of $65,000 in its first year, the Ferrofluidics Corporation has expanded to sales in the multimillions and expects to top the $100 million level by 1990. The company is the sole production source for ferrofluidics and ferrofluidics systems, but there is growing interest in the broad potential of magnetic fluid technology. Says the company President, "What the NASA technology launched was not just a single company, but probably a whole new industry."

These examples illustrate only a portion of the cases where small businesses have capitalized on NASA technology. In the future, we expect that small business firms will continue to enjoy the fruits of research and development resulting from NASA's aeronautics and space efforts. Whether small business is directly involved in NASA R&D or learns about new advances through NASA's technology transfer programs, there is ample evidence to show that small business enterprises benefit in large measure through aerospace technological innovation.

We cite the foregoing to illustrate the extent of NASA's efforts and experience in fostering the objectives of S. 881 and H.R. 4326. These bills have a number of highly commendable features, some of which flow from recent studies of national industrial innovation and the level of small business contributions to it. Although we find elements to applaud in these bills, our actual experience in pursuit of the bills' objectives leads us to conclude certain aspects of the bills ought be changed to provide for pursuit of those objectives in a more flexible manner which would recognize the substantial differences in the missions of the agencies to which it would apply.

There are numerous ways of reaching the small business research and technology community to capitalize on this reservoir of innovation potential through the Federal procurement process in fulfilling Agency needs or missions. These ways will vary, perforce, according to the difference in character of Agency missions.

DOD, for example, recently initiated a new effort in its Defense Small Business Advanced Technology Program. This program seeks to promote innovative solutions to important scientific and technical problems facing the Defense Department in the performance of its mission. In this respect, it is somewhat similar in its objectives to NASA's research and technology objectives program in that each seeks innovative approaches and solutions to problems in discrete research and technology areas important to their mission. Both likewise provide a means for applying the results of innovation commercially in the private sector.

The National Science Foundation, which has a different mission, has, on the other hand, pursued another means of reaching small business research and technology capability through its Small Business Innovation Research Program. This program evolved from the Research Applied to National Needs (RANN) effort commenced in 1971 and has as its purpose the conduct of research on NSF program objectives with particular attention to the potential for developing innovative products and services. It is broad based in the scope of disciplines it covers and couples Federally supported applied research with follow on venture capital and to private sector market needs. Its thrust is to support research on important scientific and engineering problems which may lead to the commercial introduction of new products and services by the private sector.

The present bill is clearly patterned after the National Science Foundation's Small Business Innovative Research Program. It would, in effect, without authorizing appropriations for its execution, require most other agencies engaged in significant research and development efforts to create similar programs and realign portions of their R&D appropriations to execute this program notwithstanding any other limitations on these appropriations embodied in the agencies annual authorization and appropriations acts.

Furthermore, this SBIR program would be overlayed on the applicable agencies as a requirement distinct and apart from any other existing and ongoing small business oriented research or technological activities and the relationship of these activities to the agencies mission.

In the case of the National Science Foundation, the fiscal year 1976 Authorization Act required 7.5 percent of the money available to NSF's Research Applications

Directorate be obligated to small business. The fiscal year 1977 Authorization Act mandated that NSF establish an Office of Small Business Research and Development. The fiscal year 1978 Authorization Act increased the small business set-aside in applied research to 12.5 percent.

In testifying before the Committee on Small Business, U.S. House of Representatives, on March 19, 1980, Dr. Jack T. Sanderson, Assistant Director for Engineering and Applied Science, National Science Foundation, described the NSF SBIR program as follows:

"The objective of the program is to use the NSF funds to conduct feasibility research on the innovative idea and as 'pre-venture' capital to attract follow-on private support. We are attempting to increase the number of small science and technology based firms capable of conducting R&D for the government and industry, and capable of developing innovative products and services. In addition, the program seeks to fund, on a highly competitive basis, creative, high-risk, potentially high pay-off research ideas. NSF sets the general topics for the research but provides the flexibility for creative, innovative research within those guidelines.

"The program involves three phases. Phase I provides awards of up to $25,000 for six months to demonstrate the feasibility of the research and the capabilities of the firm. This phase is open to any firm which meets the SBA definition of a small business. Phase I is also designed to reduce the time and cost to the firms of preparing formal research proposals.

"Successful firms in Phase I of this program become eligible to submit Phase II proposals to carry out the principal research effort for up to 24 months. Funding in the second phase of the program depends upon the quality of the proposal and the firm's ability to obtain follow-on private funding from a third party to pursue development toward commercial use. In short, federal funding pays for research in selected topic areas in Phase I and II, and private funding pays for subsequent work toward commercial use. Phase III is the development phase in which commercial objectives are pursued from the same research base but with private capital.

"An important aspect of the program is its focus on technology transfer. Small businesses are encouraged to involve university scientists and engineers as consultants where appropriate. Large firms have shown considerable interest in providing both phase III funding to the small firm and a royalty agreement for any resulting sales in return for the right to license or acquire the technology.

"NSF is effectively providing 'pre-venture' capital at the time of highest risk and greatest difficulty in obtaining initial funding of innovative ideas. In addition to this, NSF seeks to protect the proprietary rights of the participants. Patent rights are necessary if follow-on venture capital is to be obtained. The government retains 'march-in' rights if the patent is not exercised within a reasonable period of time and the right to use the patent for its own purposes."

This form of endeavor is within the role and mission of the NSF but not necessarily within that of other agencies to which the SBIR program would apply. NASA does not have a support and assistance mission to the extent described in the SBIR program. However, within the scope of the Agency's mission, it is already substantially exceeding the objectives of this Bill in terms of small business participation in its specific research objectives and in private sector commercialization of innovations derived from NASA research and development. The enclosed table sets forth NASA fiscal year 1980 R&D procurement activity from all business concerns and small business participation in this procurement program.

Turning to specific provisions of the S. 881 and H.R. 4326 bills, we offer the Committee the following comments and observations:

Section 9(b) of the Small Business Act would be amended: (1) to include a provision for the SBA to develop and maintain a source file and an information program to assure each qualified and interested small business concern the opportunity to participate in Federal agency Small Business Innovation Research programs; (2) interject the SBA in some manner in the acquisition process of multiple Federal procurement agencies to coordinate and orchestrate the release of those agencies requirement solicitations for specific needs; and (3) in some manner to conduct a form of oversight over Federal agencies procurement activities in the area of acquisition of specific research and development requirements from small businesses in fulfillment of their missions.

Section 9 of the Small Business Act would be further amended to provide that the Administrator, OFPP, in conjunction with the Small Business Administration would promulgate and issue appropriate regulations to carry out the provisions of this Act. Since the entire purpose of this Act is to be executed through the Federal procurement process, the regulations envisioned in this section of the Act must be, perforce, procurement regulations. The Office of Federal Procurement Policy Amendments of 1979 (Pub. L. 96–83) rescinded the authority of OFPP to promulgate procurement regulations while simultaneously charging that Office with the responsibility for: (1) developing a proposal for a Uniform Federal Procurement System, (2) a proposal for a Central Management System for Federal procurement, and (3) a proposal for legislative reform of the current Federal procurement statutes. These are due in October 1981. The legislative history of this statute took note of the fact that there are already some 4,000 statutes impacting the Federal procurement process and found in Section 2 of the Act that:

"Sec. 2. It is declared to be the policy of Congress to promote economy, efficiency, and effectiveness in the procurement of property and services by and for the executive branch of the Federal Government by—

" '(1) promoting the use of full and open competition in the procurement of products and services;

" '(2) establishing policies, procedures, and practices which will require the Government to acquire property and services of the requisite quality and within the time needed at the lowest reasonable cost;

" '(3) improving the quality, efficiency, economy, and performance of Government procurement organizations and personnel, and eliminating fraud and waste in the procurement process;

" '(4) avoiding or eliminating unnecessary overlapping or duplication of procurement and related activities;

" '(5) avoiding or eliminating unnecessary or redundant requirements placed on contractor and Federal procurement officials;

" '(6) identifying gaps, omissions, or inconsistencies in procurement laws, regulations, and directives and in other laws, regulations, and directives, relating to or affecting procurement;

" '(7) achieving greater uniformity and simplicity, whenever appropriate, in procurement procedures;

" '(8) otherwise promoting economy, efficiency, and effectiveness in Government procurement organizations and operation;

" '(9) coordinating procurement policies and programs of the several departments and agencies;

" '(10) minimizing possible disruptive effects of Government procurement on particular industries, areas, or occupations;

" '(11) improving understanding of Government procurement laws and policies within the Government and by organizations and individuals doing business with the Government; and

" '(12) promoting fair dealing and equitable relationships among the parties in Government contracting.' "

These bills would overlay the Federal procurement process with another statute at a point when the focus of Federal procurement effort, by Congressional mandate; is to simplify the already over burdened process. They would also give a significant regulatory role to a nonresearch and development agency which by virtue of its mission, heritage, staffing and capability is not in a position to deal with the complexities of advance technology pursuit and acquisition embodied in R&D Agency missions.

To be more precise, Section 9 of the Small Business Act would be amended to require each agency with a research and development budget over $100,000,000 for any fiscal year to establish a Small Business Innovation Research (SBIR) program. The program enforces the goals of the bills through the acquisition process. In addition, each agency with an R&D budget exceeding $20,000,000 would set its own goals not falling below the amount of 1981 awards to small business.

We believe it is most significant that, while the bills provide brief, broad outlines of an SBIR program, they do not anticipate that a small agency's R&D budget (less than $100,000,000) might be cut in subsequent years. If that were to happen, the agency would be forced to award an increasingly higher percentage of its R&D budget to small business, without any mitigating considerations, because the statutory base is fiscal year 1981 and, therefore, inflexible.

The particulars of the bills incorporate a number of other components which are of concern. Section 3 of the bills would amend Section 9(b) of the Small Business Act to assign specific functions to the SBA in relation to SBIR programs. SBA would develop and maintain an SBIR source file and information program. These functions would, in effect, duplicate the synopsis function already required by the Small Business Act, as well as repeat the source lists maintained by the individual agencies to establish a record of all firms interested in participating in Federal contracts.

These requirements represent a commendable objective for matching Government-wide R&D requirements, in a timely manner, with potential small business sources. However, the number of requirements embodied in solicitations released during the course of the year by all the R&D agencies encompassed by the definitions in this bill would constitute a volume of changing schedules beyond the reasonable capability of an agency to absorb and interface meaningfully with similar centralized source files which itself would require continuous updating to remain current. If the bills contemplate a Federal agency-wide application of the NSF approach embodied in its Small Business Innovation Research program, then such provisions should recognize the vast dissimilarities in size, scope, mission and emphasis of the agencies involved. For example, the NSF program solicitation seeking small business innovation research that closed on April 1, 1981, contemplated approximately eighty awards of $30,000 each in twenty-two categories of feasibility or theoretical research. In research efforts similar to the above NSF solicitation, NASA publishes annually to the scientific, educational and industrial sector its research and technology objectives and plans which cover some sixty-five categories and over seven hundred specific objectives.

We announce the issuance of this Research and Technology Objective Plan (RTOP) annually in the Department of Commerce Business Daily, distribute copies to all NASA centers, all SBA regional offices and make further copies available to any interested parties. Our 1980 annual distribution totaled 2,900. Enclosed hereto is an eight page excerpt from NASA's 152 page 1981 RTOP Summary and will illustrate the range and depth of information made available against which both solicited and unsolicited proposals may be made through the year. We believe each R&D agency is best equipped to disseminate its own particular research needs among the specific research and scientific communities engaged in relevant endeavors.

The provision permitting SBA "to independently survey and monitor" each agency's SBIR program (new subsection 9(b)(6)) would serve to authorize a single non-R&D agency to perform oversight on the R&D acquisition processes of several agencies, thus duplicating the authority already vested in both the Executive and Legislative branches and potentially inconsistent with the central procurement management system contemplated in Public Law 96-83. Subsection 9(b)(7) would establish another network of reports to the Congress duplicative of OFPP procedures now in place to monitor the agencies' acquisition activities.

Beginning in fiscal year 1982, S. 881 and H.R. 4326 would require each affected agency to place through a "funding agreement" a minimum percentage of its R&D budget with small business under a SBIR program. The percentage increases in the following years. We are opposed to this provision. While our Authorization and Appropriation Acts are fairly explicit in delineating the purpose, programs and specific line items to which our funds apply, these bills would overlay the same appropriations with a substantially different set of program requirements unrelated to our authorizations. We agree with the Commission on Government Procurement which recognized the need for such goals to be flexible, giving due recognition to such variables as the procurement mix, the capability of small business to supply the Government's needs, and other factors that influence contract award. Precise percentages should be determined administratively on the basis of the small business potential in agency Authorization/Appropriation Acts, for to mandate permanent legislative goals as proposed in the Bills, may well prove to be incompatible with other Congressional program authorizations and/or missions.

The establishment of SBIR goals of the nature proposed on the basis of aggregate appropriation amounts does not take into account any current mission oriented agency actions or programs in which small business technology firms participate, and specifically precludes consideration of the results of those programs in the SBIR small business awards mandated.

To this extent they impose on Federal R&D agencies, a separate, distinct, and specific form of program in addition to existing small business, disadvantaged business, women-owned business, and labor area surplus programs currently in effect. Although the set-aside percentages mandated by the bills appear small, they must be considered on top of the ongoing socioeconomic programs the acquisition process is currently carrying. Furthermore, we believe that these percentages, as are all other socioeconomic goals, imposed upon total appropriation amounts, do not consider the extent to which authorizations/appropriations are available for this purpose.

For example, in Fiscal Year 1980 NASA Research and Development Appropriations, including supplemental appropriations for the Space Shuttle totalled $4 billion. It comprised some twelve major categories broken down into in excess of 100 program line items. Of approximately 89 percent or $3.6B placed with businesses, $2.8B or 77 percent constituted major contracts or funding actions on existing major programs such as the Space Shuttle, Space Laboratory, Shuttle Upper Stages, Delta, Atlas-Centaur, and Scout launch vehicles, Space Telescope, Galileo, Landsat-D, the

Deep Space Net and the Spaceflight Tracking and Data Net. In the execution or continuation of such programs under the 1980 Authorization/Appropriation Acts, little if any latitude exists for the applications of the funds involved for other purposes such as contemplated by S. 881 and H.R. 4326.

On the other hand of the remaining $783M in FY 1980 R&D procurements from business, for other than those major and continuing programs cited above, some $246M (31 percent) was placed with small business. Over $100M of this amount was placed through set-asides. (See Table 1.) These results constitute the ongoing efforts of the Agency to apply such R&D resources, where it has reasonable latitude, to the growing involvement of small business technology oriented firms.

Mr. Chairman, we believe the NASA procurement initiatives described offer reasonable evidence that the resources of the small business community are progressively being turned to the type of innovation research contemplated by S. 881 and H.R. 4326.

Permitting the procuring agencies to continue to act within long-standing procurement channels should continue to produce positive results. As mentioned above, the means are already in place for any R&D agency to obtain innovative research from small business. Certain new incentives such as the patent rights bestowed on small business in Public Law 96–517 offer attractive advantages for small, high technology firms to participate in the Government search for innovation.

To ensure that the goals of these bills are met, we would support legislation that encouraged R&D agencies to undertake the type of initiatives illustrated by the NSF SBIR program appropriately adapted to their mission. We do not believe that a rigid set of predetermined statutory percentages applied to one specific type of SBIR program will aid in achieving those aims.

Mr. Chairman, NASA clearly endorses the objectives of these bills, however suggests that they can be better achieved in a different manner. We would support and endorse a bill with the same objectives without permanent, inflexible mandated percentage requirements but requiring selected agencies to develop programs similar to those cited but adapted to the selected agencies' missions and programs. A bill embodying those features directing small business innovation research initiatives on a trial or pilot basis by several agencies as may be designated by the Executive Branch would, in our judgment, fulfill the objectives of S. 881 and H.R. 4326 while simultaneously permitting the flexibility in scope necessary to fit this concept to the operation of multiple agencies.

Thank you for the opportunity to present NASA's views on this matter.

NASA-TM-82189

Research
and
Technology
Objectives
and
Plans
SUMMARY

National Aeronautics and
Space Administration

FISCAL YEAR 1981
RESEARCH AND
TECHNOLOGY PROGRAM

INTRODUCTION

This publication represents the NASA Research and Technology program for FY 1981. It is a compilation of the "Summary" portions of each of the RTOPs (Research and Technology Objectives and Plans) used for management review and control of research currently in progress throughout NASA. The *RTOP Summary* is designed to facilitate communication and coordination among concerned technical personnel in government, in industry, and in universities. We believe also that this publication can help to expedite the technology transfer process.

The *RTOP Summary* is arranged in five sections. The first section contains citations and abstracts of the RTOPs. Following this section are four indexes: Subject, Technical Monitor, Responsible NASA Organization, and RTOP Number.

The Subject Index is an alphabetical listing of the main subject headings by which the RTOPs have been identified.

The Technical Monitor Index is an alphabetical listing of the names of individuals responsible for the RTOP.

The Responsible NASA Organization Index is an alphabetical listing of the NASA organizations which developed the RTOPs contained in the Journal.

The RTOP Number Index provides a cross-index from the RTOP number assigned by the NASA responsible organization to the corresponding accession number assigned sequentially to the RTOPs in *RTOP Summary*.

As indicated above, responsible technical monitors are listed on the RTOP summaries. Although personal exchanges of a professional nature are encouraged, your consideration is requested in avoiding excessive contact which might be disruptive to ongoing research and development.

Any comments or suggestions you may have to help us evaluate or improve the effectiveness of the *RTOP Summary* would be appreciated. These should be forwarded to:

National Aeronautics and Space Administration
Office of Aeronautics and Space Technology
Washington, D.C. 20546
Attn: Edmund L. Sanchez, Acting Director
Resources and Management Systems Division (RM-3)

Walter B. Olstad
Acting Associate Administrator for
Aeronautics and Space Technology

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TYPICAL CITATION AND TECHNICAL SUMMARY

RTOP ACCESSION NUMBER → W81-70216 506-54-63 ← CURRENT RTOP NUMBER

RESPONSIBLE NASA ORGANIZATION → Langley Research Center, Hampton, Va

TITLE → **ADVANCED ELECTRONIC COMPONENTS**

TECHNICAL MONITOR → R. L. Stermer 804-827-3535 ← TELEPHONE NUMBER

(506-20-23; 506-18-13) ← RELATED RTOPS

The objective is to develop advanced electronic devices and components for increased capability and cost efficiency of information handling. Additionally novel device concepts are to be evaluated to enhance information acquisition in terrestrial observation and similar aerospace applications. A balanced approach between research contracts, grants, and in-house research is used. Theoretical and experimental investigations of materials and device concepts will be conducted in-house. These studies provide a basis for a balanced contractual effort to develop those material and device technologies which have potential of improved performance and cost effective information handling. ← TECHNICAL SUMMARY

RESEARCH AND TECHNOLOGY OBJECTIVES AND PLANS

a summary **FISCAL YEAR 1981**

OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY

Aeronautics Research and Technology Base

Aerodynamics Research and Technology

W81-70001 **505-31-11**
Ames Research Center, Moffett Field, Calif.
COMPUTATIONAL METHODS AND APPLICATIONS IN FLUID DYNAMICS
V. L. Peterson 415-965-5265
(505-51-11)

The overall objective is to develop the capability for predicting complete aerodynamic characteristics of given aircraft shapes and designing new configurations aerodynamically optimized for specific missions to a degree that preliminary concepts can be developed, evaluated, and screened with less time, cost, and wind tunnel tests. New mathematical methods, languages, and compilers will be constructed to realize the most effective use of available computer resources. Computer programs will be developed to simulate turbulence and to solve complex fluid dynamics problems for the complete spectrum of flight speeds, from low subsonic, transonic, to hypersonic, and for steady and unsteady, inviscid and viscous flow over two- and three dimensional configurations. Fundamental experiments will be performed to verify these codes and to provide the necessary turbulence models. The Reynolds number domain will extend from conventional wind tunnel conditions to full scale flight conditions for present and future aircraft. The timely transfer of advanced computational aerodynamics technology to the aerospace community will be implemented by developing and disseminating computer codes applicable to practical aerodynamics problems.

W81-70002 **505-31-13**
Langley Research Center, Hampton, Va.
COMPUTATIONAL FLUID DYNAMICS
J. C. South, Jr. 804-827-2627
(534-02-13; 505-31-33; 505-31-23)

The purpose of the research is to provide the fundamental computational methods required for calculating complete aerodynamic characteristics of complex aircraft shapes and for optimizing aircraft shapes for a given mission. The primary emphasis will be basic research in numerical and analytical methods coupled with large-scale computers. Most computer codes developed in this plan will be of the pilot code class; when a method or code is proven as a useful preliminary tool, further developments of the codes for more complex configurations will be supported by RTOPs which are applications oriented, such as ACEE and EET. Research includes viscous and inviscid flow methods for all speed ranges, with near term emphasis on the subsonic-transonic range. The main interest is in large, nonlinear problems; studies include acceleration of iterative methods for large systems of finite difference equations, mesh generation methods, turbulence modeling, and algorithms suitable for vector processor computers such as STAR and CRAY.

W81-70003 **505-31-21**
Ames Research Center, Moffett Field, Calif.
TURBULENCE AND MODELING
L. L. Presley 415-965-5859
(505-31-51; 505-31-31; 505-31-41)

The objective is to conduct analytical and experimental studies into complex turbulent flow fields. Specifically, turbulent flows interacting with shock waves, highly curved bodies and general three dimensional surfaces are considered. Emphasis is placed on obtaining detailed and accurate experimental data that can be used to guide the development of mathematical models for turbulent structures. These mathematical models will subsequently be used to develop fast efficient methods for the prediction of both attached and separated turbulent flows.

W81-70004 **505-31-23**
Langley Research Center, Hampton, Va.
TURBULENT DRAG REDUCTION
D. M. Bushnell 804-827-4546
(505-31-13)

Research to significantly improve our ability to predict and control the behavior of turbulent shear flows including boundary layers, free shear layers and recirculating/vortex flows. Theoretical and experimental research to (a) reduce turbulent skin friction drag, (b) control stream disturbances in transonic/supersonic/hypersonic tunnels, (c) determine sensitivities of laminar boundary layer transition process for application to laminar flow control, and (d) improve understanding of physics/structure of turbulent shear flows and turbulence modeling for computational fluid dynamics. Drag reduction research investigates moving/compliant walls, fixed transverse and longitudinal surface waves and large eddy breakup devices, primarily for eventual CTOL transport application. Free stream turbulence research develops stagnation chamber treatments and laminar flow and rapid expansion nozzles to improve validity of wind tunnel measurements, especially for data where transition and flow separation are present. Detailed boundary layer transition studies with controlled input disturbances determine sensitivity of laminar flow control techniques to operational factors such as engine noise, suction surface blockage and surface irregularities. Detailed experiments using hot wires, LV/Raman, Rayleigh scattering and resonant Doppler systems provide data for development and validation of turbulence closure models in three dimensional boundary layers, three dimensional free mixing and corner/recirculating/vortex flows.

OFFICE OF AERONAUTICS AND SPACE TECHNOLOGY

W81-70005
Ames Research Center, Moffett Field, Calif. **505-31-31**
AIRFOIL AND WING DEVELOPMENT
L. L. Presley 415-965-5859
(505-31-21; 505-31-41; 505-31-61)

The objective of this RTOP is to conduct research that will lead to the development of a technology base for the design of advanced airfoils and wings. The scope of the research encompasses both unsteady and steady flow about single element airfoils and steady flow about multi-element airfoils. The single element airfoil program has three main elements: (1) development of advanced computational codes for optimum airfoil design; (2) development of adaptive wall technology for airfoil and wing testing, and (3) theoretical and experimental study of transonic flow about oscillating airfoils. The multi-element airfoil program is focused around coordinated experimental studies which will provide data required for guidance and verification of theoretical work directed toward the analysis of the subsonic, viscous flows around multi-element airfoils and wings that are equipped with high lift devices. Emphasis will be placed on merging turbulent shear layers, experimental studies of turbulent separated flow, and the analysis of the three-dimensional flow over finite wings equipped with leading-edge flaps and trailing-edge flaps.

W81-70006
Langley Research Center, Hampton, Va. **505-31-33**
AIRFOIL DEVELOPMENT
R. W. Barnwell 804-827-4514

The Airfoil Aerodynamics program is to provide analytical methods and computer codes coupled with experimental procedures and test facilities for the design and development of airfoils and airfoil systems in both steady and unsteady flows and to employ these tools in the development of advancedtechnology single- and multi-element airfoils for all classes of aircraft. The applications include propeller sections and airfoils for fixed- and rotary-wing aircraft and involve the subsonic and transonic speed regimes and laminar and turbulent boundary layers. The program includes: (1) the generation of precise theoretical and rapid engineering analyses and optimal-design methods which have been verified through appropriate selected experiments; (2) the development of new and improvement of existing airfoil research facilities to improve the range and validation of two-dimensional data; and (3) the generation and documentation of the aerodynamic behavior of new families of airfoils, airfoil controls and high-lift systems by the use of both theory and experiment in support of U.S. industry and DOD to satisfy specific and special-purpose airfoil needs.

W81-70007
Ames Research Center, Moffett Field, Calif. **505-31-41**
AERODYNAMIC THEORY/EXPERIMENTAL INTEGRATION
L. L. Presley 415-965-5851

The objective of this research is to expand the aerodynamic technology base and provide a basic understanding of the aerodynamic flow fields about complete wingbody-tail configurations as well as individual components through the useful angle-of-attack range and from subsonic through supersonic Mach numbers. This is being accomplished by the development of new theoretical methods, and by the integration of theory and experiment to yield a more complete understanding of the aerodynamic phenomena. The primary theoretical methods under development include a transonic wing-body-tail code using the full potential equations and an advanced linear panel code applicable to both subsonic and supersonic flow. In addition, methods will be developed to combine various calculation techniques to predict more complex flows, such as jet induced effects, or to numerically optimize aircraft components. The integration of theory and experiment includes the development of techniques to rapidly compare calculated and measured results and to integrate theoretical and experimental procedures to provide a more complete definition of the aerodynamic characteristics.

W81-70008
Langley Research Center, Hampton, Va. **505-31-43**
CONFIGURATION AERODYNAMICS
R. T. Whitcomb 804-827-2252
(534-02-13)

The technical objective of this research primarily is to increase the technology for the development of practical means for improving the aerodynamic performance of high subsonic and supersonic aircraft through the generation and application of an expanded experimental data base and the development and evaluation of improved theoretical and empirical design and analysis methods. Also, technology relative to minimizing trailing vortex induced turbulence will be developed. The expansion of the experimental data base will be accomplished through parametric wind tunnel tests, guided by theoretical analyses with emphasis on favorable interference of multiple lifting surfaces, interacting vortex flows and vortex lift optimization, favorable interference lift by proper integration of the propulsion system with the airframe, development of improved high aspect ratio supercritical wing and wing-winglet configurations and efficient under-the-wing propulsion system installations, supercritical flow, investigation of swept forward wings, and application of variable geometry concepts. Improved analysis methods for both attached flow and vortex flow concepts, methods for predicting complete surface aerodynamic load distribution, with emphasis on critical aerodynamic and structural design conditions involving edge separation induced vortex flows will be developed. Further, theory and experiment will be used to investigate high lift systems for landing and takeoff and means for increasing the off-design performance of configurations with high cruise efficiency. 22

W81-70009
Hugh L. Dryden Flight Research Center, Edwards, Calif. **505-31-44**
AERONAUTICS FLIGHT EXPERIMENTS
T. R. Sisk 805-258-3311

The objective of this RTOP is to provide a continuing research and development effort into the problems associated with the fundamental understanding of fluid and flight mechanics with special emphasis on the relationship to large-scale vehicles operating in a 'real world' environment free of interference effects. These efforts include experimental aerodynamic studies to improve our ability to predict the efficiency of vehicles moving through the atmosphere, and to define the effects of Reynolds number, surface condition, excrescences, and local and freestream flow conditions on lifting surfaces and complete configurations. Also included will be investigations in support of or verification of wind-tunnel studies. Experimental research pertaining to laminar and turbulent boundary layer phenomena and on the separation characteristics of turbulent flow over afterbodies will also be conducted as will analytical studies appropriate to support the fluid mechanics disciplines.

W81-70010
Ames Research Center, Moffett Field, Calif. **505-31-61**
AERODYNAMIC TEST METHODS AND INSTRUMENTATION
G. Lee Stainle 415-965-5861

The general objective of this research is to provide the technology for increased ground-based aerodynamic experimental research capability required to improve prediction of performance and flight characteristics of conceptual or new aircraft designs and the exploration of advanced aerodynamic concepts. Tunnel wall constraints, flow quality and means for simulating higher Reynolds number flow will be investigated analytically and experimentally to improve the quality of test results. To improve the state-of-the-art in non-intrusive measurement capability, advanced laser velocimetric and holographic instrumentation systems will be developed to obtain fundamental fluid mechanic measurements such as mean velocities, turbulence intensities, and Reynolds stress components. Infrared camera technology will be explored as a means of locating shock-waves and regions of separation on wind tunnel models.

Mr. LAFALCE. Our next witness will be Mr. Hilary Rauch, Director of Procurement and Assistance Management for the Department of Energy.

TESTIMONY OF HILARY RAUCH, DIRECTOR OF PROCUREMENT AND ASSISTANCE MANAGEMENT, DEPARTMENT OF ENERGY, ACCOMPANIED BY JOHN SHEPARD, DIRECTOR, OFFICE OF SMALL AND DISADVANTAGED BUSINESS UTILIZATION

Mr. RAUCH. Thank you, Mr. Chairman.

I am accompanied by Mr. John Shepard, Director of our Office of Small and Disadvantaged Business Utilization.

With your permission, I will briefly summarize our prepared testimony.

In the Department's view, small business R. & D. participation is inextricably connected with the small business program as a whole on the one hand and the agency's mission on the other.

It takes long-term efforts and institutionalized processes to develop an effective program, but always with an eye toward the agency's programmatic requirements.

Within that framework, we believe the Department's efforts to institutionalize an effective small business program, which are identified in my prepared testimony, can be best measured by our results.

But most briefly, every year since the Department was established, our overall small business goal has been increased, and in every year we have, in fact, exceeded it.

Let me summarize my testimony regarding the several bills aimed at strengthening the role of small, innovative firms in federally funded R. & D.

The Department supports the objectives of these bills, particularly within the context of our focus in the Department of Energy on long-range, high-risk end of the energy R. & D. spectrum.

In a real sense, it is this very focus which is clearly distinguished from the focus of other agencies, for example, which makes it unwise, in our view, to mandate the details of a rigid small business innovative research program for R. & D. agencies whose missions and R. & D. needs vary widely.

Furthermore, we strongly oppose fixed percentage set-asides as a means of increasing the small business share of Federal R. & D. dollars. Rather than make what we believe would be the more efficient use of small business capabilities, such set-asides would not take into account differing agency missions, nor will fixed set-asides recognize the extent to which R. & D. funds are already committed to programs which by their very nature do not offer significant opportunities for small business participation.

Let me be a little more specific on that particular point. As you are aware, the Department of Energy has a large R. & D. budget—on the order of $5.8 billion in fiscal year 1981—a significant portion of which is dedicated to nuclear weapons R. & D.

For example, in fiscal year 1981 the budget includes on the order of $1.6 billion for defense-related research and development, most of it conducted in Federal facilities. The required size of these kind of facilities, and the cost of equipment required to support them clearly tend to limit the significant small business prime contract participation in this research.

I could go on and give you further rationale, but in the interest of brevity, I would refer you to our prepared testimony. This testimony elaborates other reasons for our position, and also points out a number of other provisions which present serious difficulties. It also makes suggestions which may be helpful in revising the bills.

With such suggested revisions, the Department of Energy believes a flexible small business innovative research pilot program could be shaped to meet each agency's needs, at the same time allowing efficient use of Federal funds and effective participation by small business. We are most willing to participate in such a program.

This concludes my summary, Mr. Chairman. I will be happy to answer questions when you are finished with the panel presentations.

[Mr. Rauch's prepared statement and attachment follow:]

PREPARED STATEMENT OF HILARY RAUCH, DIRECTOR, PROCUREMENT AND ASSISTANCE MANAGEMENT, DEPARTMENT OF ENERGY

Mr. Chairman, it is an honor to appear today to discuss small business innovation research. I am accompanied by John Shepard, Director, Office of Small and Disadvantaged Business Utilization.

As you know, the Department of Energy (DOE) formally came into existence on October 1, 1977. Energy Research and Development Administration (ERDA), a principal predecessor agency of the DOE, served on the seven member "Ad Hoc Interagency Panel on Small Firms and Federal Research and Development." This panel was instrumental in the analysis of the Federal research and development problem as it related to small firms and to the recommended solutions set forth. The report of this panel, chaired by Dr. Jacob Rabinow was submitted to the Office of Federal Procurement Policy, Office of Management and Budget, on February 24, 1977. By virtue of ERDA's participation, DOE was intimately acquainted with the so-called "Rabinow Report" even though it was not formally released to Federal agencies until September 20, 1978.

In studying the problem, the DOE viewed the issue of small business research and development participation ad fundamentally allied with the promotion of small business contracts and the promotion of small business set-asides in particular. Further, it was, and still is, considered a problem requiring long-term effort in order to produce the type of growing small business participation desired. Therefore, a strong, long-term program was implemented even as the Department of Energy was undergoing formation.

Some of the actions taken were as follows:

(1) A special office was created on October 1, 1977, to coordinate the small business, the disadvantaged business, and the labor surplus area programs. This office, Procurement Business Affairs, was considered necessary to ensure effective liaison with the small business high technology sector as well as the maintenance of programmatic coordination with small and disadvantaged specialists at each major field location. These specialists were also designated in October 1977.

The responsibilities of the Procurement Business Affairs Office included coordination of those additional initiatives I am about to address. This Office had been responsible for the preparation of reports to the Congress on small business and small business R&D since October 1977. On January 31, 1979, functions of the Procurement Business Affairs Office and other legislatively mandated activities were vested in the Office of Small and Disadvantaged Business. This continuity is considered important, and it is this office which is able to "screen" procurements for small business R&D and other types of requirements suitable for small and disadvantaged business as described in the material submitted to the Committee.

(2) The Department determined that long-term growth in the usage of small business firms, especially research and development firms, required a data bank giving the capabilities of small technology based firms which could be easily accessed by any of its major field offices and its major research and development facilities (contractor-operated). The Department jointly developed and funded the Procurement Automated Source System (PASS), with the Small Business Adminis-

tration. Since the Department was the co-founder of the system (now used throughout the Government), it was able to require priority loading of research and development (R&D) "key words." This nationwide system now contains 53,389 small business firms of which 11,596 are R&D firms. There are approximately 80 terminals in use across the Nation. Twenty-two of these terminals are used by the Department of Energy, providing easy access to small firms in all forms of high technology.

(3) In order to insure that every procurement would be considered for small business (including disadvantaged business) and that small business set-asides would be emphasized, the Department instituted a mandatory, independent screening process. Appropriate procurement actions were, and are, reviewed in advance of solicitation by a Small Business Specialist of the Department to determine whether all or a portion may be suitable for small businesses. Procurement processing is completed only after this review has taken place.

(4) The special use of unsolicited proposals was also considered vital. The Department took two crucial steps. First, it instituted a centralized unsolicited proposal system, with its own computer based tracking system, thus providing for expeditious consideration of proposals.

Second, the Department established unsolicited proposal reserves in order to stimulate submission of innovative approaches from the small business, high-technology sector.

(5) The Department instituted a comprehensive goaling program on October 1, 1977. This program involved the establishment of individual goals for every program office, every procurement activity, and every Government-Owned, Contractor Operated (GOCO) facility as well as other major contractors. These were negotiated and approved annually for each separate component, i.e., small business, disadvantaged business, labor surplus area set-asides, and now women-owned businesses. I will elaborate later upon the highly satisfactory results of this goaling process.

(6) The Department considered that special efforts were necessary to notify the small business firms of the need for innovative approaches. Three special forms of notices and solicitations were developed. First, the Program Research and Development Announcement (PRDA) solicits proposals in areas where R&D is required within broadly defined areas of interest but where it is difficult to describe the precise nature of the work to be undertaken. In this case, even multiple awards may be made with dissimilar approaches or concepts. This supports new and creative solutions. Second, a Notice of Program Interest (NPI), which is not a solicitation, periodically is used to set forth areas of interest concerning research where DOE hopes to receive unsolicited proposals. Third, a Program Opportunity Notice (PON) has been used to solicit proposals for nonnuclear demonstration projects using existing commercial technology, e.g., technology already developed by a small firm. These three approaches have been considered a very important part of the DOE program to stimulate and support small business R&D.

(7) The Department engaged in the equivalent of a Small Business Innovation Program, suitable for energy technology, almost two years prior to the President's October 31, 1979, request that the National Science Foundation explore the feasibility of such programs in other agencies. This effort included the Energy Inventions Program, the Appropriate Technology Small Grants Program, augmented by other initiatives.

(8) The Department further determined that the promotion of small business usage through its offices and its laboratories, testing facilities, and plants (operated by contractors) would be enhanced by special recognition from the Secretary. As a result, in March of 1978, the Secretary established a special system of awards to offices and GOCO facilities: (1) for those who exceeded their goals, and (2) those who exceeded their goals by 20 percent with highly meritorious effort. These awards are now highly coveted throughout the Department and its plants and laboratories.

Other initiatives were taken, tested, reformulated, and became a part of a long-range program as are reflected later in this testimony and in the material supplied to the Subcommittee on September 9, 1981. By way of partially indicating the results of this effort, the non-GOCO R&D prime contract obligations for Fiscal Year 1980 totalled $942.9 million. Of this $88.9 million or 9.43 percent was awarded to small business. Our GOCO laboratories, testing facilities, and plants during this same period subcontracted $1.765 billion of which $219.3 million was for R&D. Of this, $57 million or 26 percent was awarded to small businesses. These results were achieved through program building tailored to the unique demands of the DOE.

As you are well aware, the several House of Representatives' bills, including HR 4326, HR 4254, HR 4345, and HR 3091 are also aimed at strengthening the role of small, innovative firms in federally funded research and development. More specificially, the purposes of the bills are: (1) to stimulate technological innovation, (2) to use small business to meet Federal R&D needs, and (3) to increase private sector commercialization of innovations derived from Federal research and development. These goals are laudable ones, and the Department firmly supports the intent of these bills. We know from experience that research is essential to technology development, and it is the United States' success in the development and marketing of technology that, in part, has made our standard of living possible. Small businesses have played and will continue to play an important role in this effort. Before I address the legislative specifics, let me comment briefly on the R&D environment with which the Department of Energy is intimately familiar and upon which the bills would impact.

Various sectors of the economy make their most significant contributions to this technology development effort at different points on a spectrum which range from the most basic scientific research through development, demonstration, and commercialization. At the basic research end of the scale, the Federal Government supports projects at universities and other nonprofit organiziations because the private sector alone cannot reasonably be expected to undertake this research which is long-term and often high-risk.

In addition, there is no guarantee of benefits to the private sector due to the generic and unpatentable nature of the basic research. At the other end of the spectrum—in the development and marketing of products and services for profit—it is the private sector, small and large business alike, that excels.

Indeed, this distinction is reflected in the Administration's policy on the role of the Federal Government in the energy field. Briefly stated, the Government will focus its support on R&D that industry cannot be expected to undertake. Industry will be expected to support demonstration of promising near-term technologies and to be responsible for their ultimate commercial deployment. It will be the marketplace, not Government, which will supply the enormous capital investments required to support the commercial introduction of new energy technologies into the economy.

Thus, DOE's focus is on the long-range, high-risk end of the spectrum that the private sector, small business included, is reluctant to undertake without Government support. Even though opportunities are more limited in basic research, let me stress our firm support of small business participation in Federal programs whereever those capabilities can best be used. It is for this very reason that the Department embarked upon a long-range program of the nature described earlier including the screening program.

I also referred earlier to the goaling process the Department started in October 1977. As the Committee is aware, the Department now establishes goals in conjunction with the Small Business Administration (SBA) for contracts of $10,000 or more. Departmental achievement against SBA goals is measured by dollars received by small businesses from all sources, prime and subcontract. We have aggressively pursued and exceeded our small business goals. Every year since the Department was established, our overall small business goal has been increased, and we have exceeded it. This year, our overall goal was increased again from $1.491 billion in Fiscal Year 1980 to $1.617 billion in Fiscal Year 1981, and we hope to exceed it. If we meet our Fiscal Year 1981 goal, it will represent 20.5 percent of the total value of procurement—a significant commitment to the involvement of small business in the Department's programs. It is significant that the Department of Energy also goals small business set-asides at both the prime and the government-owned, contractor operated facility level.

The Department's support for small business is evidenced not only in its performance with regard to goals but in on-going activities. In fact, the Energy-Related Inventions Program sponsored by the Department is one of several DOE activities considered to be a Small Business Innovation Research (SBIR)-equivalent program and is described in the material submitted prior to the hearing. It is conducted in three stages leading to commercialization.

The Inventions Program provides for technical screening (first stage) and in-depth analysis (second stage) of inventions by the Office of Energy-Related Inventions in the National Bureau of Standards (NBS), Department of Commerce, and follow-on support by the DOE of inventions identified by NBS as promising. This program gives particular attention to small businessmen and individual inventors, and provides one-time assistance, usually in the form of grants to assist the NBS-recommended inventors in developing or commercializing their inventions. In an attachment to my testimony I have provided additional information on some of the Department's initiatives aimed at encouraging small business involvement in our programs.

Now let me turn to the legislation and discuss its possible impact on R&D within the DOE. My comments may shed some light on the difficulty of legislating the details of an SBIR Program for R&D agencies whose missions and R&D needs vary widely across the Federal Government. While the Department would be interested in participating in some form of pilot SBIR program which would allow the designated agencies flexibility to plan a program in accord with an agency's mission needs, we have serious problems with several sections of the bills as written. My comments are intended to highlight the problem areas and provide constructive suggestions that may be helpful in revising the bills. For convenience, reference to sections in the pending legislation are those in HR 3091 and HR 4254 unless stated otherwise.

The problem of flexibility vis-a-vis agency missions is particularly evident in the new Section 9(f) of the Small Business Act created by the legislation which sets forth a schedule for SBIR expenditures for agencies whose research and development budgets exceed $100 million. That schedule in HR 3091 assigns to the SBIR program not less than two-tenths of 1 percent of the R&D budget in fiscal year 1982, not less than six-tenths of 1 percent in fiscal year 1983, and at least 1 percent in fiscal year 1984 and subsequent years. We strongly oppose these fixed percentage set-asides as a means to increase the small business share of the Federal R&D dollar. Rather than make efficient use of small business capabilities, such set-asides would not take account of differing agency missions, nor would a fixed set-aside recognize the extent to which R&D funds are already committed to programs which, by their nature, do not offer significant opportunities for small business participation.

Let me be more specific. As you are aware, the DOE has a large R&D budget ($5.8 billion in fiscal year 1981), a significant portion of which is dedicated to nuclear weapons R&D. For example, in fiscal year 1981, the budget includes $1.6 billion for defense-related R&D most of it conducted in Government-owned facilities. The required size of research facilities and the cost of equipment to support them tend to limit significant small business prime contract participation in this R&D. Similarly, the Department anticipates spending about $834 million in fiscal year 1981 in the fossil energy program. At a prime contract level, these projects offer few opportunities for small business participation. The same is true of the large, expensive accelerator, laboratory, and research facilities funded under the High Energy and Nuclear Physics and Magnetic Fusion Programs. It is also worth noting that total DOE R&D dollars will decline between fiscal year 1981 and fiscal year 1982, particularly in the Fossil, Conservation, and Renewable Energy Programs. Thus, the opportunities for small business decline.

A similar flexibility problem exists in the new Section 9(a)(3) created by HR 4254, HR 4373, and HR 3091, which calls for a 3-phase SBIR. The first phase would address the technical and economic feasibility of ideas proposed; the second phase would consider the potential commercial applications of the research or R&D proposed; and the third phase would call for private capital to pursue commercial applications with some follow-on Federal contracts. These phases are not necessarily applicable to all R&D agencies. Therefore, this section should be amended to permit flexibility where the three phases do not apply. This will avoid inhibiting an agency's ability to achieve the bill's objectives. The new Section 9(h) imposes research and development goals for Federal agencies, including the DOE, whose R&D budgets exceed $20 million. The same practical effect is presently provided by Section 15(g) of the Small Business Act which requires the head of each Federal agency, in consultation with SBA, to establish goals for the participation of small business in all procurement contracts having a value of over $10,000. Rather than add to the proliferation of goals categories already subject to interagency negotiation with the SBA under Section 15(g) of the Small Business Act, we strongly urge that R&D small business considerations be treated as another component inherent in current small business goaling procedures.

Section 3 in adding Section 9(b)(5) requires coordination in the release of the SBIR solicitations with the SBA. Such coordination would directly involve another agency in our acquisition process. Scheduling agencywide procurements involved in the SBIR Program through a clearinghouse at the SBA would pose an unnecessary administrative burden and delay issuance of solicitations. We could, nonetheless, keep the SBA informed of the timing of solicitation releases and insure that the solicitations receive broad visibility through synopsis in the Commerce Business Daily and other appropriate trade journals and scientific publications.

Another comment related to SBA responsibilities concerns Section 3 as it amends Section 9(b) of the Small Business Act. A new item 9(b)(6) would mandate SBA to "independently survey and monitor the operation of SBIR programs within participating agencies." We believe that this oversight of R&D agency acquisition processes by a nontechnical agency such as SBA is inappropriate and duplicates existing oversight authority vested in the executive and legislative branches.

Section H of HR 3091 also amends Section 9 by adding (J)(1)(A) to provide for standardized SBIR solicitations, proposals, and evaluation processes. This requirement could deter use of already existing innovative types of solicitations well adapted to small business participation, such as the Department's Program Research and Development Announcement and Program Opportunity Notices. We would recommend that each agency be allowed flexibility to use the solicitation instruments best suited to its mission and needs.

The legislation also proposes a definition of R&D that is different from the several existing definitions already in use. For Federal reporting purposes, the Department is directed to use a 7-stage definition for obligations collected by the Federal Procurement Data System. The Federal Procurement Data System definition is not identical to that employed in the Office of Management and Budget Report Number 44 which details R&D budget authority. Since the objectives of the bill can be carried out in the absence of a statutury R&D definition, we would recommend that the definition be deleted rather than add yet another definition to the system.

As I indicated earlier, my comments have focused on HR 3091 in proposing revisions to the legislation that would result in a flexible SBIR pilot program which could be shaped to meet each agency's needs. This flexibility would allow the most efficient use of Federal resources and the most effective use of small business capabilities.

That concludes my testimony. I will be happy to respond to questions.

[ATTACHMENT]

SMALL BUSINESS INITIATIVES AND ACTIVITIES

INITIATIVES

1. Unsolicited proposal reserves

One method for reaching out into the small business R&D community is through a DOE innovation called the Unsolicited Proposal Reserves. In addition to our regular unsolicited proposal procedure, we initiated in FY 1979 a new program under which Federal reserves are set-aside exclusively to support meritorious unsolicited proposals submitted by small businesses. Three program offices have signed agreements with the Procurement and Assistance Management Directorate in which administrative procedures were prescribed, including the Office of Energy Research and the Offices of Conservation and Renewable Energy and Fossil Energy.

Acceptance of unsolicited proposals is governed by DOE and Federal Procurement Regulation (FPRs) [DOE PR 1-4.909(d)], including the following criteria: Unique, meritorious, methods, approaches, or ideas which originated with or are assembled together by the offeror; overall scientific, technical, socio-economic merits; potential contributions to DOE mission; and related experience and qualifications of key personnel.

2. Procurement automated source system [PASS]

PASS is an automated data bank of small, disadvantaged, and women-owned businesses (SB/DB/WOB) accessed through remote terminals located at various Government and commercial locations throughout the United States. This system, jointly funded by the DOE and the SBA, has consistently grown since its inception in 1977. At present, PASS contains 40,889 SB/DB/WOB firms whose capabilities can be displayed at 65 terminals. The DOE has installed a total of 21 terminals at operations offices, the Strategic Petroleum Reserve and GOCO facilities. The DOE has the largest quantity of remote terminals in the Federal Government.

3. Procurement Preference Reviews of R. & D. and other procurement requests

The Headquarters' Office of Small and Disadvantaged Business Utilization (OSDBU) conducts preference reviews or "screening" of individual procurement requests accompanied by "415" review forms originating from DOE Headquarters organizations. Based on their analyses, OSDBU Small Business Specialists recommend small business/labor surplus area set-asides or refer for 8(a) consideration. In fiscal year 1980, OSDBU-designated staff members analyzed 983 work statements contained in procurement requests valued at $1.4 billion in order to match requirements to capabilities of small businesses, disadvantaged businesses, and labor surplus area (SB/DB/LSA) concerns. This matching process in accomplished through consultation with programmatic outlay offices, retrieval from DOE's PASS terminal, active source files, and recent procurement history. Field SB/DB Specialists conduct screening of procurement requests originating at field locations.

Due in large part to our transactional screening procedure, 8(a) awards rose from $32.4 million in fiscal year 1979 to $103.7 million in fiscal year 1980. During the same period, small business set-asides grew from $309.7 million to $418.6 million. LSA set-asides reached $74.3 million in fiscal year 1980, $30 million higher than in the previous fiscal year.

4. Recent small/disadvantaged business program initiatives

Assigned small and disadvantaged business goals to program as well as procurement offices; established Secretarial small/disadvantaged small business awards program; established a DOE-wide network of SB/DB Specialists and Technical Advisors at Headquarters, field installations and GOCO plants and laboratories; designated products and services purchased at DOE and contractor operated sites as class set-asides; signed agreement with SBA to raise construction class set-aside threshold to $3 million; and modifying PASS keyword thesaurus to incorporate technical coverage by technology discipline. Solar and fossil expanded coverage have been transmitted to SBA for inclusion in their PASS central data base.

SOLICITATION INSTRUMENTS

Program research and development announcements [*PRDA*]

This solicitation vehicle was developed to encourage submission of innovative ideas from individuals and private concerns, including small businesses and public entities. PRDA's are used to provide potential proposers with information concerning DOE's interest in entering into arrangement for research, development, and related projects in specified areas of interest.

Announcements for PRDA's are published in the CBD, and multiple awards usually result from each PRDA solicitation. If after review of a PRDA's requirements, it appears that the R&D effort described in it is especially suited to small businesses, one or more of the awards resulting from the PRDA are set-aside exclusively for small, technology-based firms.

DOE uses the PRDA only where R&D is required within broadly defined areas of interest to support program goals, but it is difficult, if not impossible, to describe in any reasonable degree of detail the nature of the work contemplated because of: The multiplicity of possible approaches, within the current state of the art, available for solving the problems; the desirability of involving a broad spectrum of organizations in seeking out solutions to the problems posed; the expectation that many individual proposers will have unique qualifications or specified capabilities which will enable them to perform portions of the research or development program (without necesarily possessing the qualifications to perform the entire program) so that the overall support may be broken into segments which cannot be ascertained in advance; and the desirability of fostering new and creative solutions.

Program opportunity notices

This is another unique solicitation technique in which:

(*a*) DOE encourages the submission of proposals to accelerate the demonstration of the technical, operational, economic, and commercial feasibility and environmental acceptability of particular energy technologies, systems, subsystems, and components. Program opportunity notices are used to provide information concerning scientific and technological areas encompassed by DOE's program. DOE issues, from time to time, program opportunity notices for proposal for demonstration of various forms of nonnuclear energy and technology utilization.

(*b*) Synopses of the notices are published in the CBD. In addition, the notices are circulated directly to potentially interested individuals, private and public entities (excluding Federal agencies) and associations. They are especially directed to small business concerns and socially and economically disadvantaged concerns to insure that they are given every opportunity to participate in such procurements.

Mr. LAFALCE. I am very pleased to hear the Department of Energy's willingness to participate in a small business innovative research program, at least on a pilot basis.

But at this point in time I would like to introduce into the record a letter dated September 10, 1981, addressed to Congressman LaFalce, from Dr. Ernest Blase.

I only introduce the letter at this time because it indicates that there certainly was a disposition by Secretaries of Energy to establish a SBIR office. At least so it seemed through their testimony.

[The letter follows:]

R & D ASSOCIATES
1401 Wilson Blvd. – Suite 500
Arlington, Virginia 22209
(703) 522-6400

September 10, 1981

The Honorable John LaFalce
Chairman, House General Oversight
  Subcommittee
Small Business Committee
U.S. House of Representatives
Washington, D.C. 20515

Dear Congressman LaFalce:

Thank you for the opportunity to comment on HR4373, the Small Business Innovation Research Act which has been introduced by Congressman Berkeley Bedell. My name is Dr. Ernest Blase and I am presently employed by R & D Associates. Prior to that, I was the Director of the Staff Office of Advanced Technology Projects in the Office of Energy Research of the Department of Energy. I held this position for approximately three years.

The Office of Advanced Technology Projects (ATP) was established at the direction of Dr. John Deutch, who was then the Director of Energy Research. The basic goal of ATP was to provide DoE with the capability to identify promising new high risk, high payoff technology projects in any energy field and to move rapidly to take advantage of the identified opportunity. Most of the projects supported had demonstrated scientific feasibility and were aimed at demonstrating technological feasibility.

Within DoE, the ATP Office became identified as one that would be receptive to new ideas from small business. Typically, the small business concerns who came to DoE were less skilled in finding the right office to present their ideas to and, additionally, it was my perception that DoE generally favored big business for reasons of risk, convenience and high level discussions. By this I mean that if a program manager in a technical area wanted to play it safe, and minimize DoE's risk in R&D, then the large laboratory or multibillion dollar business can be counted on to make the incremental improvement in a technology which can be reported as research progress. Exceptions of course exist, but generally I believe the true small business innovator is at a disadvantage when seeking DoE funding for these reasons.

CORPORATE OFFICE: P.O. BOX 9695, MARINA DEL REY, CALIFORNIA 90291 • TELEPHONE (213) 822-1715

As Director of the Office, I had no preconceptions or funding level goals for small business firms, but it turned out that over 50% of the funds for Advanced Technology Projects which I was responsible for went to small businesses. During this period, it was my pleasant experience to discover the remarkable inventiveness of America's small business concerns.

I was so encouraged by this that I twice prepared for DoE management, proposals to have DoE initiate a Small Business Innovation Research program to expand DoE's support in this area. In the original proposal to DoE management I cited the Congressional testimony DoE had made when Secretary Duncan was in office, stating DoE's willingness to initiate a Small Business Innovation Research Program modeled after the program initiated at the National Science Foundation. My proposal, which followed the NSF model very closely was turned off by the Deputy Director of Energy Research at DoE. The second proposal was to Secretary Edwards to establish a New Office of Advanced and Innovative Technology Projects which was more ambitious in that it would have combined several DoE offices dealing with advanced high risk projects and included special emphasis on the needs of small business innovative research programs. This, too, was turned down by DoE management.

I am delighted to see the Congress taking steps to make it a requirement for major outlay programs in Government R and D to fund small business. My only concern is that the set aside is too small.

Sincerely,

Ernest F. Blase

EFB:jfw

Mr. LaFalce. We are hearing testimony from all of you today, such a pleasant disposition to do such a pleasant thing, and yet although this certainly can be rebutted, it seems that whether the actual proposal was made to establish such an office, it was turned aside, not necessarily by the individuals at this table, but by the institutions.

But before we get into the questions, let's have the last witness from the agencies, Mr. Henry Kirschenmann, from the Department of Health and Human Services.

TESTIMONY OF HENRY G. KIRSCHENMANN, JR., DEPUTY ASSISTANT SECRETARY FOR GRANTS PROCUREMENT, DEPARTMENT OF HEALTH AND HUMAN SERVICES; ACCOMPANIED BY WILLIAM S. ROBB, ASSOCIATE DIRECTOR FOR EXTRAMURAL RESEARCH AND TRAINING, NATIONAL INSTITUTES OF HEALTH

Mr. Kirschenmann. Thank you, Mr. Chairman.

I have with me Dr. William S. Robb, Associate Director for Extramural Research and Training at the National Institutes of Health.

As you know, NIH is the primary research funding organization of our Department. We appreciate the opportunity to share our views with you today.

The Department of Health and Human Services recognizes the important role played by small businesses in innovation. We have traditionally made special efforts to encourage the involvement of small businesses in our programs, including the R. & D. area. We have consistently met and exceeded our small business goals, and we intend to continue and extend our efforts.

The Department's principal research supporting agency is the National Institutes of Health. NIH carries out its research program principally through the award of grants to universities, hospitals, and nonprofit institutions. The preponderance of these awards are for basic research. It also awards research contracts. In fiscal year 1980, NIH awarded approximately $400 million for R. & D. contracts. A significant fraction of this sum, however, funded clinical trials, an area of research which is inapplicable to small business set-asides. Nevertheless, $31 million was awarded to small businesses in open competitions, and $3 million more was awarded from set-asides for small and minority business. The majority of these contracts have resulted from competition with all sectors of the biomedical research community. Others are the result of unsolicited proposals and special set-asides for small or disadvantaged business.

The NIH has made a particular effort to search out and identify small R. & D. firms to participate in its mission. It has done so through general "sources sought" announcements in the Commerce Business Daily requesting firms to provide it with résumés of capabilities in relevant fields; active participation at a number of meetings cosponsored by the Small Business Administration and the National Science Foundation in various parts of the country aimed at encouraging small business to participate; and solicitation through the CBD and the NIH "Guide for Grants and Contracts" for sources and proposals for specific procurements. In addition, it encourages individual representatives of small businesses to contact staff in the Office of the Director, NIH, or various program staff in individual components of the NIH, and they do so frequently. These individual contacts may entail the submission of unsolicited proposals or, more frequently, a search for more specific information regarding NIH programs. They result in the identification of specific program areas in which the firm may have the competence to compete for certain procurements, including small business set-asides which programs frequently authorize. Each program unit maintains the source lists of small firms that might be competent to provide certain types of research and research support. These source lists are augmented by frequent "sources sought" announcements that have as their intent the identification of additional small firms in order to determine whether a particular set-aside may be appropriate. Staff of the SBA participate in this process.

NIH has gone further, it is looking anew at potential areas which can be reserved for small businesses before the planning for the procurement process has begun. For example, there may be substantial opportunities for small businesses in providing the data support functions for multi-institutional clinical trials. More recent effort has focused on attempting to upgrade subcontracting opportunities for small and disadvantaged firms in accordance with the provisions of Public Law 95-507.

The focus of this law is consistent with our conclusion, now supported by the GAO in its report to the Congress titled Consistent Criteria are Needed to Assess Small Business Innovation Initiatives, that in mixed industries, where small firms must complete with larger firms, small businesses are likely to be complementary rather than primary contributors. "Their innovations are frequently components or subcomponents of larger system." We believe the biomedical research industry is to a large extent mixed with a predominance of larger organization.

In summary, those specific positive steps that the NIH has taken or has underway to increase participation by small and disadvantaged firms in its R. & D. contracting programs are:

Presentations about the small business program to various NIH scientific committees;

Reviews of requests for contracts and contract planning documents by the small and disadvantaged business utilization specialists and by the collaborative program procedure officer in order to identify work that can be performed by small and disadvantaged firms;

Attendance at conferences and fairs by NIH contracting and program officials for the purpose of locating small and disadvantaged businesses with biomedical research and development capabilities;

Issuance of sources sought announcements in the CBD and advertisement in the American Association of Small Research Companies Newsletter for the purpose of identifying firms with biomedical research and development expertise;

Interviews on a frequent basis with representatives of small and disadvantaged firms to discuss their capabilities and to inform them of the procedures for participating in the NIH research contracting program;

Training of program staff at regularly scheduled courses for project officers' to inform them about the various small and disadvantaged business promotion programs and initiatives;

The recent sponsoring, in conjunction with the Public Health Service, of a conference for a number of the larger prime contractors to discuss subcontracting initiatives under Public Law 95-507. We view this as a particularly important mechanism, since we share the view of the GAO in its report to the Congress, titled "Consistent Criteria are Needed to Assess Small Business Innovation Initiatives," that in mixed industries where small firms must compete with larger firms, small businesses are likely to be complementary rather than primary contributors. "Their innovations are frequently components or subcomponents of larger systems." The applied biomedical research industry remains, to a large extent, mixed with a predominance of larger organizations; it is too early to tell whether the advent of recombinant DNA and hybridoma—cell fusion—technology will alter this balance substantially.

The formation of committees of program officials to identify specific biomedical programs eligible for small business set-asides; to assess the capabilities of small businesses with biomedical expertise; and to disseminate these findings to relevant program areas.

Our experience in identifying small businesses leads us to conclude that there are only a limited number of small businesses which possess biomedical research capabilities. This is not to say that there are no firms which we have not reached. There undoubtedly are, and we recognize we need to do more to reach them. We believe their number is not nearly so large as anticipated by the several bills being considered by the Congress. Seventy-seven small businesses were active as NIH contractors in fiscal year 1980. About 100 additional ones have reached the central NIH source file as the result of small business conferences, solicitations and so on. In addition to this 170, other small firms have been NIH contractors at one time but are not at present. Some small firms have contacted NIH in the past, but many of these have failed to successfully compete for funding or convince program officials that their proposals meet NIH needs. Even so, NIH has attempted to maximize the participation of those small businesses it has identified in those areas in which they have a capability.

For example, it has utilized a number of small businesses to perform biomedical evaluation studies and surveys, to conduct studies in virology, immunology, toxicology, and for animal production and the preparation of cells and tissue cultures. Additionally, millions of dollars have been awarded to small business to establish and maintain rodent production centers, and small biomedical research and development firms are participating in the cancer carcinogenicity and toxicity study. Other small businesses are providing support for the national high blood pressure education program, the National Heart, Lung, and Blood Institute has a contract with a small business to develop an implantable left heart assist system, and a genetic research firm, Biotech Research Laboratories, an 8(a) contractor, has derived a major portion of its revenues from contracts with the NIH. One such activity is a project on human cytomegalovirus—CMB—to produce a commercial monoclonal antibody from hybridoma technology.

But as I indicated earlier, Mr. Chairman, that portion of the Department's program which is carried out with the contracts is modest. The large majority of the program, basic research, is conducted through grants via the competitive review system. Until now, only nonprofit organizations could compete for these awards. That restriction is being removed, thus opening the doors of opportunity to all who can make a contribution, the only limitation will be the ability to perform quality research.

The removal of the current prohibition will permit small as well as large profitmaking organizations to submit investigator-initiated research proposals and compete for the approximately $2.0 billion of research grants awarded annually which they were not privy to compete for previously.

We believe this action will offer an excellent voluntary opportunity for small businesses in the biomedical area to demonstrate their initiative and express their creativity, to participate fully in the Department's major research programs and effectively advance the goals of this committee and the Department of Health and Human Services. If we are wrong in our assessment of the small business potential in biomedical research—and there is a large, until now, untapped small business resource—this action, we believe, will surface them and in a way that is complementary to our research role. More importantly, it will bring them into the mainstream of our research programs.

Mr. Chairman, our present policies and actions show our support of the commendable objectives of this committee to aid and stimulate small business in the R. & D. area. We, also, would very much like to see the fruits of basic research endeavors translated into a commercial environment by both large and small businesses. However, the Department has serious reservations about the magnitude of the set-aside requirements proposed in the several bills before the Congress.

We are honestly concerned, based upon our experience previously cited, that the small business community in the area of higher medical research cannot productively absorb a 1 or more percent increase in allocation on top of existing set-asides. The private sector health research efforts are concentrated in large firms. The nature of biomedical research usually requires, as it does in the area of drug development, investment of millions of dollars and highly specialized staffing facilities. Therefore, we fear it is unrealistic to assume that there are hundreds of existing new firms that could take advantage of the envisaged SBIR programs.

If there is to be a set-aside, we don't believe a percentage applied uniformly to all agencies is desirable. Some agencies' R. & D. missions lend themselves better to SBIR type awards; others do not. SBIR awards are targeted toward, and are more applicable to, applied research and the development of technology, rather than the generation of new scientific information.

NIH, on the other hand, primarily supports basic biomedical research, most of which is not amenable to commercialization. NASA, DOD, and DOE together spend about 83 percent of the total Federal applied research and development—A. R. & D.—funds.

NIH spends about 5 percent of the total Federal A. R. & D. funds. Therefore, the impact of a uniform set-aside at NIH would be substantially disproportionate to that absorbed by other Federal agencies. Government-wide figures prepared by the National Science Foundation illustrate the great disparity. For the Federal Government as a whole, 62 percent of all spending is on development rather than research and 47 percent of that total is performed by industrial firms. But for NIH, the corresponding figures are 11 percent and 4 percent. Therefore, the overall effect of the 1 percent set-aside calculated against the total NIH research budget would be 5 to 12 times greater than the effect on the Government as a whole.

We are also concerned about the possible adverse effects of the set-aside provisions. We fear we will lose part of our appropriation. A SBIR set-aside would have the practical effect of either reducing existing research levels $40 million for each 1 percent set-aside——

Mr. LAFALCE. Would you repeat that?

Mr. KIRSCHENMANN. An SBIR set-aside would have the practical effect of either reducing existing basic research levels $40 million for each 1 percent set-aside, or require that additional funds be appropriated to DHHS to maintain existing program levels, a difficult requirement during the current stringent budgetary situation.

This is particularly burdensome for NIH because Congress has directed that agency to establish support for investigation-initiated research at a level of 5,000 new and competing grants each year.

NIH obligates the vast majority of its funds several years in advance. The set-aside would therefore compete directly with the limited discretionary funds required for stabilization of research grant levels.

Finally, we have reservations about the inflexibile three-phase program continued in the bills. The health research orientation of the NIH program is in the field of basic and applied biomedical research, very little of which is oriented toward commerical applications. We question the general feasibility of converting the results of basic research into commercially usable technology within the timeframe and the individual award levels envisioned by the bills. Moreover, agency funding is excluded from phase 3 of the program, a point at which commercialization occurs. Of the few small business proposals that NIH could likely fund, many would fall within the range defined as phase 3. For example, this group would include the development of new diagnostic procedures or therapeutic agents for the so-called orphan diseases, the diseases which take a severe toll in terms of human life and well-being, but which are of sufficiently low incidence to make venture capitalists skeptical that there would be a reasonable return on investment.

Because of our concerns with the two major provisions of the several bills, the DHHS has concluded that the following administration alternatives are preferable to and greatly diminish the need for set-aside legislation:

Goals rather than set-asides for individual agencies. This kind of flexibility is important since some agencies' R. & D. missions lend themselves to SBIR awards and others do not.

Grants to for-profit organizations. The Department is removing its longstanding prohibition against making grants to profitmaking institutions. This will open the door to $2 billion of research activity annually for small businesses.

Public Law 95-507 requires that Federal contracts which exceed $500,000—$1 million in the case of a contract for the construction of any public facility—must include a small business subcontracting plan. This law is expected to increase the amount of small business subcontracting derived from Federal funds. In our view, and which appears to be supported by the GAO study on small business firms, this area offers good potential in the biomedical field.

Patent and Trademark Act Amendments. The inclusion of small businesses under the provisions of the trademark and patent amendments—Public Law 96-517—also will have a beneficial effect as they will be able to own and share in the royalties derived from patents generated as a result of Federal funding.

Economic Recovery Act—The recently passed tax package, the Economic Recovery Act of 1981, "H.R. 4242," will encourage and assist R. & D. efforts by small as well as large businesses by providing a 25-percent tax credit for increases in expenditures for research, and by expandijng the amount deductible for contributions of property used for research or research training.

In conclusion, Mr. Chairman, we believe we have done well but we recognize that we have not done enough to stimulate small businesses into the biomedical research, and we will do more. But both the differences among research programs and missions and the budgetary costs involved lead us to believe that an automatic quota at statutory levels of effort, coupled with a rigid three-phase program, is an undesirable approach.

The Department of Health and Human Services believes in furthering small business and will continue to support it within its role as the major basic biomedical research agency of the Government. We will be glad to answer any questions you may have.

Mr. LAFALCE. We are at an impasse. We could say we have basic goals, but maybe we shouldn't. We would then have to have the same operating assumptions.

Let's take my statement. When I said, but I quoted from an OMB report that was made public in late 1978—and this wasn't me making it up, it was OMB, a different administration to be sure, but it came out of OMB—which said that firms with less than 1,000 employees accounted for almost one-half of the major U.S. innovations from 1953 to 1973.

That ratio of innovations to sales is about one-third greater in firms with less than 1,000 employees than firms with over 1,000 employees. Firms with less than 1,000 employees have a ratio of innovations to R. & D. employment, which is approximately four times greater compared with firms with more than 1,000 employees, et cetera.

Those are the assumptions I am operating under in part which compel me to say that Government has got to come up with something which is going to gear its research effort a bit more in some appropriate manner to the small business sector.

Do we basically agree on the validity of those assumptions, or would anybody here like to refute that?

Mr. **Long**. If I may, Mr. Chairman, speaking first for DOD, I don't think we disagree with those assumptions or the objectives at all. As an observer hearing the testimony of my colleagues from the other agencies, I think that statement applies—we are all consistently in accord with the assumptions in the OMB report and the objectives. I don't think anybody testified to the contrary.

Mr. **LaFalce**. Right. I just wanted to make sure of that. If these assumptions are correct, it ought to be a goal of Government to facilitate the ability at least of the small business sector to access R. & D. dollars. So far we are together. Then the question comes how.

I think I hear you people saying, well, we agree with this, but leave it to us, and leave it to our devices to enhance the role of small business in R. & D. and other areas, too. But right now we are just focusing in on R. & D.

Now the problem is, gentlemen, that I and a great many other Members of Congress, over 80 percent of the Senate, apparently, don't trust you. Now, when I say don't trust you, I don't mean that in the sense that we think you are lying, or we think you are deceitful, or we think you are trying to fool us. But it is a question of institutional inertia that comes up with the heirarchy of values that you might have.

There are things in your in-box that perhaps demand your immediate goods that, to you at the moment, to me at the moment, were I in your shoes, would seem so much more important they wouldn't try, or you wouldn't try to change, to wrestle with, to defeat the institutional biases that exist, that seems to prevent a greater portion of the Federal dollar for R. & D. going to small business.

Now, because of this distrust, if you were left on your own—not distrust of your intent, but just of the ordinary workings of individuals in Government, Government itself—there is a feeling on the part of a great many of us, well, the only way we are going to accomplish our goals is to legislate a set-aside.

Now I hear from you, boy, do we have problems with a legislative set-aside. To be sure, I am aware of the validity of the difficulties that you tick off. They are real. They are not imaginative. They are not illusory. They present you problems.

But you know, are the problems worth wrestling with in comparison with the goals that we might achieve? That is one question.

Another question is, well, are there better ways of reaching those goals? Now you would probably want to ask, or answer the latter question first.

Are there better ways of reaching those goals? And I have been prepared over the years to listen to better ways and I still am.

But I haven't seen that. Even when Congress has legislated goals, not set-aside, but goals, or I shouldn't say when Congress has legislated goals, but Congress has legislated that the administration set goals, we have still seen institutional inertia without congressional prodding, primarily by my subcommittee.

Now what is a way out of it? Maybe we can strike some type of compromise. Maybe not. Maybe I could say: Hey, we could probably muster up two-thirds of the votes if need be in the House and the Senate, especially when you have 82 sponsors in the Republican-dominated Senate.

Or maybe if we pass this bill, so often when you come to a small business bill the administration is opposed to, once it's been passed, the administration hasn't vetoed it because of the fact that they don't want to be cast as antismall business or what have you.

There are a whole slew of factors that come into play there. I could sit down and say we have to come up with some legislative quotas. I am not going to be satisfied with anything less.

And how can we make it reasonable? Can we come up with certain exceptions excluding certain types of R. & D.? That is a reasonable approach.

Could we not legislate a specific percentage for each agency? Legislate a specific set-aside percentage for Government in toto and then leave it up to the administration to determine how that shall be met via each agency?

That is a possible way. I see no problems with that. Should we not establish set-asides but legislate goals? Targets we must meet, something similar to Public Law 95-507 for R. & D. in particular or should we amend Public Law 95-507 and say we call upon the administration to call for goals, not just for small business and—but also for R. & D. for each agency.

And if we did do that, should we also legislatively establish a figure which would have to be met by Government overall?

Those are just a few of the possibilities but rather than question each of you in a nitty-gritty way, who would care to comment on a range of the possibilities I have discussed?

Admiral EVANS. I would, Mr. Chairman.

Mr. LAFALCE. Yes, Admiral Evans.

Admiral EVANS. You are quoting from the Rabinow report at the outset. I would like to stress again that NASA, and I know the Department of Energy, both had member participants and were in a measure responsible for the material from which you quoted. So, that is where it originated. We participated in it, No. 1.

Mr. LAFALCE. A bit louder again, into the microphone.

Admiral EVANS. I was simply saying that the Rabinow report that you were quoting from was put together by representatives of the agencies before you. That is where the information came from. That was the position of the agencies on the report. So, it starts there.

Mr. LAFALCE. So we are in total agreement then on the assumptions.

Admiral EVANS. Yes, we are.

Mr. LAFALCE. Yes.

Admiral EVANS. Second, my feeling is there is too much of a propensity to link the two together, research and development, and discuss it kind of as a generic category. It is not. At least in our case, the overwhelming majority of the money appropriated by the Congress for the conduct of research and development is in production-type effort, engineering development, operational development, and production. At least 50 percent of our research and development appropriation is for the Space Shuttle.

Mr. LAFALCE. Your mike is working if you will just move it a bit closer to you.

Admiral EVANS. I think it is important to separate what we are talking about between the terms "research" on the one hand and "development" on the other. They are rather different. You can do different things with one than you can the other. My personal view is you get more innovation and new ideas in the area of research than you do in the engineering and development, design and development, and fabrication of an end product.

I think in some respects the focus is in the wrong area when we talk innovation. Now, initiatives——

Mr. **LaFalce**. Is it possible, do we have the ability, or do we already separate research moneys from development moneys within R. & D.?

Admiral **Evans**. No; it is a mixed thing across the agencies, and that is one of the difficulties in terms of the manner in which data is collected.

Therein lies a problem, at least in our Agency, with respect to the amount of funding that NASA is authorized——

Mr. **LaFalce**. Let me interrupt you for a second. Congressman Bedell, we are sort of having a general discussion. Please feel free to jump in.

Admiral **Evans**. Some measure of discretion in terms of what we can do. I think it has to be realistically addressed in that light.

In 1978, and again I come back to the Rabinow report and the memoranda that I believe in your letter of September 2 to us, you quoted and asked us to provide the committee with data with respect to what we had done. We return to you about 2 inches of data of what we had done. We, indeed, in 1978, embarked on initiatives of this nature.

It is on the basis of the experience we had with that type of initiative that NASA has taken the position it has. We have found that set-asides in the category of basic research has not been a very fruitful thing to us. This is why we have gone to the area of unsolicited proposals. It is why each year we publish some 700 categories of areas we are interested in which is an attachment to the statement. It is from this that we get unsolicited proposals. It is from that that we have had a high measure of success in finding innovative ideas.

One of the concerns I have about a program of this nature, in three rigid steps, is that our experience is not that it goes as neatly and cleanly in sequence. If I might, I would like to quote Dr. Gilbert Levine, who is president and chairman of the board of Biophysics, Inc. This is his testimony before the Subcommittee on Investigations and Oversight, Subcommittee on Science, Research and Technology, on June 10, 1980.

It was in response to a question with respect to his experience on innovation and technology. He says:

> I would like to reply positively. It is possible for small business to stay in the running for a period of time, but the consequences are pretty difficult. I have just concluded a contract with NASA, a series of contracts with NASA which ran 18 years. We originally came to NASA with an unsolicited proposal to develop a technique to look for life on Mars. This was before there was any planetary program. NASA said that sounds like an interesting idea. Give us a proposal. We did. We got it funded.

He then traces the evolution of this and states that:

> I would be finishing the final report to NASA, including interpretation of the data we just got from Mars. It is an extraordinarily difficult thing to do to maintain a small company competing primarily with academic organizations and large com-

panies to maintain that position. We were able to do it. It was tough. In my view, the rewards are certainly worth it. It was the most exciting thing I have ever done.

Congressman Brown. That sounds like a testimonial for NASA.

Mr. Levine. I think it ought to be.

The reason I quoted that is because that program went 18 years. It started with innovation. It ended up on Mars. Many of our things go that route. They are not patterned in a neatly, discretely packaged manner of the sequence of events I believe these bills envision. This is not how our experience works.

The second point I must stress is that in the type of technology that we are involved in, we don't have neat, clean, orderly source lists. We have to find them. The type of technology we are involved in does not permit you to go to a data base, at least one I am aware of, to find a match. It is one of publishing what we are seeking, inviting proposals, treating them in a proper manner and funding them. It is from that route that one out of four proposals we get from small business is funded. It is from that group that over the last several years the largest number of proposals and largest amount of money NASA had funded from the standpoint of unsolicited proposals has been small business.

I would hate to see this kind of vehicle destroyed or modified, or by statute told don't do that. Come up with a program that fits the NSF. I have had extended discussions with the NSF, and it does not fit. NASA and NSF jointly agree.

Another point I would like to make is that each year, we are funding about 124 line items which are quite discrete and leave us relatively little discretion from the standpoint of appropriation of the money. The areas that become impacted with us in terms of budget reductions are in the very areas where the kind of technology money that we use for "seed planting," if I can use that term, flows from.

Mr. LaFalce. You had some questions?

Mr. Bedell. Yes; you said you didn't want to interfere with the opportunity to evaluate small business proposals and award those according to their merits.

Admiral Evans. What I meant to say was we have, over a period of time developed a system which has put us in contact with the small business, high-technology community which is highly adaptable to our mission and has paid large benefits to us. I would hate to see a program of that nature, which fits us very nicely changed, modified, or be told to do something like a SBIR from which our own experience, going from 1978, tells us does not fit.

Mr. Bedell. I don't understand how the passage of this legislation would in any way adversely affect your ability to do that.

Is there something I don't understand?

Admiral Evans. I think it will. The same type of funding we are using in the area of unsolicited proposals is the same type of funding we would use for SBIR precisely.

Mr. Bedell. Could you not still continue to do that with this additional set-aside?

Is there some reason you can't continue to do that?

Admiral Evans. Simply because provisions of the bill say that the set-aside for this SBIR shall be distinct, apart, and separate from what we are presently doing.

Mr. **Bedell**. That's right, so you can go ahead and do everything you are doing and still comply with the bill. That is my understanding.

Is there something I don't understand?

Admiral **Evans**. Not with the funding levels we have, no, sir.

Mr. **Bedell**. We don't cut your funding levels, we leave them where they are. We just say you will take some of the funding from those others and allocate it toward small business, 1, 2, or 3 percent, is all we are talking about. That would in no way prevent you from doing the other, would it?

Admiral **Evans**. No, the bill would say to us take 1 percent, 2 percent, or 3 percent of that funding level out of what you are presently doing and put it in an SBIR program which we don't believe fits our mission, that is what I am saying.

Mr. **Bedell**. No; but you still could do everything you are doing for small business and still add to it what is in this bill which is two-tenths of 1 percent to start off, isn't that correct?

Admiral **Evans**. No, sir.

Mr. **Bedell**. There is nothing in the bill that prevents you from doing it.

Admiral **Evans**. Not at all. I am saying from the authorizations we have, we could not continue to do what we are presently doing.

Mr. **Bedell**. I can't understand why you can't.

Admiral **Evans**. There is not that much funding there.

Mr. **Bedell**. Sure, you can do it if you take it out of someplace else and put it there. You have a pot of money. We are saying we want you to take 1 or 2 percent of that pot and direct it toward a specific program.

That leaves you somewhere like 98 percent of the money you had. With that 98 percent of the money that you have, if you wanted to do it, you could continue the programs just as they are, as far as small business is concerned, and take that 2 percent from the other programs.

Or can you not do that? Is there something in the law that prohibits you from doing that?

Admiral **Evans**. Let me go to my statement, if I might. In fiscal year 1980 in the research and development appropriation, approximately $3.9 billion flowed through the contract route.

Total awards were approximately $3.9 billion. $3.5 billion were R. & D. awards under the——

Mr. **Bedell**. Excuse me, what page are you on?

Admiral **Evans**. The first, table 1.

Mr. **Bedell**. What page is that?

Admiral **Evans**. It is an unnumbered page. It is the first enclosure to the statement, sir.

Mr. **Bedell**. I have got it. Thank you.

Admiral **Evans**. Those 12 categories are a breakdown of the total contract awards made and those made under the appropriation for research and development, which is what would be discussed in this bill.

In the far column entitled "Major Program Continuing Actions," those are continuing contracting actions of existing programs commencing with the Shuttle, which goes back to 1973, over which we have no discretion with respect to the expenditure of the money.

If I take what is left and simply deduct the difference between $3.572, which is the total contract awards in research and development and the $2.789 billion, I get some $783 million of which $256 million are presently going to small business in research and development.

Mr. **Bedell.** I am sorry. What is the difference between the first and second columns?

Admiral **Evans.** The first column includes construction of facilities as well as support service contracts outside the research and development area.

Mr. **Bedell.** OK. So your research——

Admiral **Evans.** Is in the second column.

Mr. **Bedell.** Yes; I still don't understand.

Admiral **Evans.** I am simply saying that the amount of funding and authorization in the appropriations over which we have reasonable discretion in its application is quite small.

Mr. **Bedell.** It is how much?

Admiral **Evans.** Around $700 million.

Mr. **Bedell.** We are talking about 2 percent then of $3.5 billion, is that right? Or 1 percent or two-tenths of 1 percent?

Admiral **Evans.** It is unclear from the bill what you are talking about because it speaks of a research and development budget. It is unclear what that means to me, to be perfectly honest.

Mr. **Bedell.** We are talking somewhere of two-tenths of 1 percent, maximum of 3 percent?

Admiral **Evans.** Right, presently, 6.9 percent——

Mr. **Bedell.** Two-tenths of $3½ billion is roughly $70 million?

Admiral **Evans.** Yes.

Mr. **Bedell.** Of the $700 million you have that would be 10 percent of your discretionary amount, is that right?

Admiral **Evans.** Yes.

Mr. **Bedell.** You are saying it is impossible for you to do that?

Admiral **Evans.** No, I am saying we are already doing it. We are awarding $246 million of that $700 million discretionary funding to small business now, or 32 percent. I am talking about 1980 awards of $246 million in research and development small business.

Mr. **Bedell.** None of that comes out of the second column? None of that applies to the second column?

Admiral **Evans.** It is in the second column.

Mr. **Bedell.** Then it is not fair to simply take the differences between the first and second and subtract the whole $246 million from the—part of it is in the second column isn't it?

Admiral **Evans.** I am saying of the $700 million, $246 million is already going to small business research and development.

Mr. **Bedell.** You are telling me that none of that $246 million is in the second column?

Admiral **Evans.** It all is.

Mr. **Bedell.** Then it is not discretionary, it is awards already granted. Your discretionary is the difference between those already granted and those you have discretion on, or did I misunderstand?

Admiral **Evans.** The $246 million represents the kind of initiatives we are undertaking now. They are a portion of the total research and development awards made to business which come to $3.5 billion.

Mr. **Bedell**. They are not the difference between the first and the second?

Admiral **Evans**. No.

Mr. **Bedell**. That is $700 million that you have discretion on?

Admiral **Evans**. No, the difference——

Mr. **Bedell**. Separate from the $246 million?

Admiral **Evans**. The difference between the first and second column.

Mr. **Bedell**. No, no, between the second and third column, the difference is $700 million?

Admiral **Evans**. That is correct?

Mr. **Bedell**. You have discretion over that?

Admiral **Evans**. Correct.

Mr. **Bedell**. If you had to take 10 percent of that discretionary to go to small business, you are telling me it would wreck the whole program?

Admiral **Evans**. I am saying there is not room on top of the $256 million.

Mr. **Bedell**. The $250 million does not apply to the $700 million?

Admiral **Evans**. Yes, it does.

Mr. **Bedell**. You have already told me the $250 million is part of the second column.

Admiral **Evans**. That is correct.

Mr. **Bedell**. And the $700 million is the difference between the second and third column.

Admiral **Evans**. That is correct.

Mr. **Bedell**. If the $250 million is part of the second column, then you surely can't say that it is part of the difference.

Admiral **Evans**. I am saying the difference over what I have discretion is between that second and third column.

Mr. **Bedell**. That is right.

Admiral **Evans**. I am saying of that difference, the $246 million goes to small business.

Mr. **Bedell**. But it isn't part of the difference because it is in the first one. If it is in the first one, it can't be part of the difference, can it?

Admiral **Evans**. Certainly it is. The discretionary amount is the difference between the total award you make—$3.6 billion in that second column, and those over which we had no discretion in terms of funding ongoing programs. I am saying simply from that amount, $246 million already went to small business.

Mr. **Bedell**. None of that $246 million then is in the third column?

Admiral **Evans**. No.

Mr. **Bedell**. Is that correct?

Admiral **Evans**. That is correct.

Mr. **LaFalce**. The whole difficulty——

Mr. **Bedell**. So small business gets none of the continuing programs that you have now?

Admiral **Evans**. Not of those major programs, no sir.

Mr. **Bedell**. Zero?

Admiral **Evans**. Those are all major programs.

Mr. **Bedell**. Energy technology, all major programs that would not apply to small business?

Admiral **Evans**. In those areas, yes, sir.

Mr. **Bedell**. Does that seem reasonable?

Admiral **Evans**. There is a fair amount of energy technology that indeed does, but that third column indicates large continuing contracts which require funding action each year.

Mr. **Bedell**. I don't want to take all the time, Mr. Chairman, but what we are really saying is that of a R. & D. budget of $3.572 billion, they decided $2.790 billion will go to big business. I think that is what they testified. I hope we realize that. Maybe that is proper. Maybe that is the way you have to do it.

Mr. **LaFalce**. I don't know that it is going to be too productive to continue this, but I do have a few questions myself on this, although I want to come back to the larger question.

First of all, the $246 million constitutes 6.9 percent, but 6.9 percent of what, of $2.5 billion?

Admiral **Evans**. Yes, of the $3.5 billion.

Mr. **LaFalce**. So you are saying then—I think one of the difficulties, Congressman Bedell, was numbering the columns one, two, and three. I think you are numbering what Admiral Evans was calling two, number one, and what he was labeling three, you were labeling number two. In any event, this $246 million is 4.9 percent of $3.5 billion means that you can at least give approximately 7 percent of your total R. & D. money to small business, because that in fact is what you have done.

Admiral **Evans**. That is correct.

Mr. **LaFalce**. So the question is what you can give via a set-aside?

Admiral **Evans**. Of the type being contemplated here.

Mr. **LaFalce**. Correct. Well, since we are contemplating all R. & D. awards, wouldn't all $3.5 billion be within that type contemplated?

Admiral **Evans**. If the focus of the bill is on appropriations, yes. If it is on budget as it presently states, I am not sure what that means.

Mr. **LaFalce**. Let's say it is on appropriations. That is the assumption. Now what is your answer?

Admiral **Evans**. Then yes, it is. It is 6.9 percent of the total research and development awards.

Mr. **LaFalce**. All right then. If we are in fact, de facto there is an award of 6.9 percent of total R. & D. to small business, what is so irrational or unreasonable about requiring percent, for example, in a set-aside?

Admiral **Evans**. In an SBIR program, Mr. Chairman?

Mr. **LaFalce**. That set-aside or an SBIR program, what set-aside, yes.

Admiral **Evans**. Simply that the SBIR program, as I understand it in the bill, does not fit our mission.

Mr. **LaFalce**. Let's just talk about a small business set-aside program as opposed to the SBIR set-aside. Does that fit your mission?

Admiral **Evans**. There is more flexibility for certain in a small business set-aside program than in a discrete——

Mr. **LaFalce**. Flexibility for what?

Admiral **Evans**. To set-aside.

Mr. LaFalce. I know there is more flexibility to set-aside. The question is whether or not there is any compatibility between the set-aside program and an accomplishment of your mission. I don't understand how there is any inherent contradiction between the concept of a set-aside and the accomplishment of your mission. We are merely saying that small business should at least in part be utilized in the pursuit and accomplishment of your mission.

Admiral Evans. I don't disagree with that at all. We are talking, however, about a set-aside aimed explicitly at innovative research, aren't we?

Mr. LaFalce. Yes.

Admiral Evans. Not a general set-aside. We are talking about a specific one.

Mr. LaFalce. Yes, R. & D., right.

Admiral Evans. Well, research as much as development.

Mr. LaFalce. We are talking about R. & D. If you would like us to talk just about R——

Admiral Evans. My feeling is that is where it is most fruitful.

Mr. LaFalce. The statistics you have given us is D.

Let's get off that course and go to the general question which I raised at the conclusion of your testimony, which really was an attempt to hold my hands out to you gentlemen to see if there is some areas where we can reach common ground. I really didn't see——

Mr. Kirschenmann. The question that you posed, the concerns that you have are the very ones that we have been wrestling with at HHS.

Mr. LaFalce. A bit louder.

Mr. Kirschenmann. Our concern is in a nutshell, that a set-aside prohibits us from using unexpended moneys. Those money, if we cannot meet the set-aside—we make an honest attempt to do so but cannot—we cannot use that leftover money for the regular purposes of the agency. In our particular situation at the National Institutes of Health, we have so many unfunded research applications that we frankly are adverse to seeing that money go unused. That is our major concern.

If there was a goal, we would have no problem with that. You could hold us accountable for our actions. At the same time, if we don't reach that goal, we are not prohibited from using the money for good purposes elsewhere. I think my department would support the idea of a goal.

Mr. LaFalce. In your interagency discussions with OMB, do any of you have any reason to believe that OMB might accept legislation which created SBIR programs and established legislative goals as opposed to actual set-asides?

Mr. Kirschenmann. I have not had any conversations with them about that. I don't know. I would certainly think they would be more responsive to that than set-asides.

Mr. LaFalce. What about the establishment of set-asides with provisions that would allow for exceptions such as you point out might be necessary for your agency?

Mr. Kirschenmann. Well, that is an alternative. You might accomplish the same objective by fine tuning the numbers the set-aside is based on.

Mr. **LaFalce**. I presented that as one of the range of alternatives, too.

Mr. **Kirschenmann**. And I think that should be done.

Mr. **LaFalce**. How could we fine tune it for HHS, for example?

Mr. **Kirschenmann**. NIH is our research agency. That is why I say NIH. I think it is unrealistic to apply or compute a set-aside based on basic NIH's research budget when we are really talking about a program the purpose of which is to stimulate applied research. Our basic research budget is $2 billion a year. Our applied research budget is somewhere in the neighborhood of $400 million.

Mr. **LaFalce**. Do all agencies distinguish between their basic research budget and their applied research budget?

Mr. **Kirschenmann**. I don't know.

Mr. **Rauch**. Mr. Chairman, if I might attempt to answer your question.

Mr. **LaFalce**. Yes.

Mr. **Rauch**. At least in part. Part of the reporting systems within the executive branch—there are a number of definitions which have been established, including definitions for research and development. Unfortunately, those same definitions are not used in the appropriations process. I think some of what you are hearing here today is a reflection of the difficulty we have of determining the basis which we are addressing, in part.

I would go on further to say, it reflects an ability within the desired program that agencies with missions in the R. & D. area feel that their expenditures must be addressed to, is a concern as well. A mandated program that does not allow that flexibility of appointing the program, developing it, and pointing it to those specific agency needs, is again a concern as well.

Mr. **LaFalce**. Would some agencies call it a blind research development? No? Yes?

Mr. **Rauch**. I don't know. I can not answer that.

Mr. **LaFalce**. NASA, for example, might—some other agency might call it applied research. You call it development because you were distinguishing so much between research and development. Or do you put applied research within research as opposed to development?

Admiral **Evans**. Certain of our programs are structured that way. When I spoke of development, I was talking largely of the effort that goes into the actual construction of, say, a Shuttle spacecraft or the ground system, once the design had taken place, to talk very broadly.

We do not make gradations as, for instance, the Department of Defense does, specifically by categories of development, research, applied research, or advanced research; nor does our appropriations. It just addresses research and development.

The appropriation itself, however, will talk to aeronautical and space research and technology, which is as close as we come to the earlier stages of research. It is where the thinking takes place. Concepts really come to fruition, somewhat tested, and then subsequently made available for application in specific programs. That is more of the development nature, which is the second stage of it. I think DOD is probably the only one that defines the research and development spectrum in discrete steps, but I shouldn't speak for them.

Mr. **LaFalce**. Mr. Long.

Mr. **Long**. If I may, Mr. Chairman, there are three distinct points that are, I think, responsive to your various questions, but they won't flow particularly naturally. As I indicated in my comments earlier, and as is in our prepared testimony, we think we do a good job in R. & D. for small businesses but recognize only a small portion of our small business R. & D. is by way of set-aside. I think our regulations will display for you our concern with the set-aside as opposed to another means of providing products and services.

Mr. **LaFalce**. Of course, I think we should be concerned that a greater percentage of R. & D. goes to small business, rather than go to a particular method.

Mr. **Long**. I understand. But I thought you asked what our concerns with set-asides were as opposed to some other method of procurement. For the record, I am quoting from "Defense Acquisition Circular 76-24," which sets forth the armed services procurement regulations on total set-asides. The sentence I will direct your attention to is as follows:

> In making R. & D. small business set-asides, there must also be a reasonable expectation of obtaining from small business the best scientific and technological sources consistent with the demands of the program.

The problem we see with the set-aside is precisely that. It forces somebody in advance to say: "In the small business community, we will find the best, and we will exclude the rest of the innovative world." Now the vast bulk of the small business R. & D. contracts that we have let over the last 3 years, which I read earlier, is won by small businesses on a competitive basis. It does not exclude the innovative from whatever other source there may be. That is our particular concern with the set-aside.

No. 2, in response to your question of how do we break out R. & D. activities as subsets, we have also a regulation that defines the following terms. I will just give the terms, not the definitions: Basic research, exploratory development, advanced development, engineering development, and operational system development. Then there are two other categories, management and support. We do collect data on our R. & D. activity by those definitions: Research, exploratory development, advanced development, engineering development, management and support.

We collect our small business activity on the overall program on the basis of the categories of research, development, and R. & D. management and support.

The third point I would like to make, I recognize that this is a hearing on a particular legislative package. One of the things that you seemed to be asking for was what can we do generally to help small business.

Mr. **LaFalce**. In the specific area of research and development.

Mr. **Long**. Yes; I allude again to Mr. Carlucci's initiatives to improve the acquisition process. As I had indicated, there is a real desire, a recognition of the need, first of all, and really desire on the part of the Department to bring more small business into the defense contracting community. And while the R. & D. is a part of it, the set-aside goal oriented on an SBIR program may be a very important part, there are a host of other things. I would candidly and very sincerely take you up on your invitation to discuss some of these matters with you at any time convenient to you.

We think there are a number of things in addition to this to be done. I don't want to divert the hearing.

Mr. LaFalce. We will get together privately, Mr. Long, to discuss those in the future. You have this hangup on a set-aside now. There is a big difference between a set-aside and quota, and quota and goal. So suppose we didn't perceive via SBIR program but just said you shall set aside so much of your money, or you shall establish a quota of 2 percent, or 3, or 6.9, or 7 percent of your moneys of R. & D., and somehow you will see that that much money goes to small business. Not necessarily through an SBIR, not money set aside in an SBIR program. But just for example take the R. & D. budget of NASA of $3.5 billion. We would say a certain percentage of that, the bottom line, must go to small business.

Do you have any hangups with that approach?

Mr. Long. If I may continue, I think not. Perhaps I can say that rather confidently because whatever goal you are likely to set we are already there as a department.

Mr. LaFalce. Some have suggested that that might be a better approach. Therefore they have suggested 25 percent. Certainly if NASA is at 6.9, we are not going to establish it at 2. So you know, maybe Congressman Bedell and Lewis and I are on the right, general direction. Maybe a little bit off base. Maybe we should say that next year NASA should have 7.5 percent of its total R. & D. budget, the following year 8, the following year 8.5, until eventually we get to 10 percent. And then look at Defense's record and do something like that. How does that approach bounce off of you?

Mr. Long. As long as it does not have the effect in the last quarter of the year, for example, of compelling set-asides because you have run short, there is nothing I think wrong with the goal-oriented process. I don't know what your notion of a remedy is if the goal isn't met. And I guess one immediate remedy——

Mr. LaFalce. We fire the Administrator.

Mr. Long. I would hate Mr. Weinberger to go to jail for a felony because——

Mr. LaFalce. They would sign an oath of office when they came in that they would reach the goal. If they didn't, well, automatically they forfeit their office. We have a precedent for that.

Mr. Long. I was worried about the remedies.

Mr. Bedell. Mr. Chairman, I think that is the issue. The fact is we have received report after report from the GAO that says that the agencies keep saying they are going to do more for small business, but they don't do it. And of course what you would like to have us do is set some goals. They are easy to set. But we seldom meet them. That would be fine with the agencies, because they could go on ahead doing what they are doing. That is the reason we have tried to put some teeth in the legislation.

We are not complete fools. If all we are doing is saying:

> Well, we are going to set some nice goals and you folks go ahead doing what you are doing when we have got report after report from the GAO saying that not just

this administration but all administrations have said they are going to do wonderful things for small business and then they don't do it.

I don't think that is our mandate as Members of Congress. So the answer is the only way we can accomplish something that hasn't been done for years and years and years is to put in legislation that is going to mandate somehow that it be done. This is the way we proposed to do it.

Mr. **LaFalce**. We are going to have to move on. Before I move on, though, I do want to give the representatives from the Department of Energy an opportunity to respond to the letter that did come from a former officer of the Department of Energy.

Mr. **Rauch**. I would suppose, Mr. Chairman, it depends a bit on the definition of the program and it is alluded to by the correspondence you read into the record. I would draw your attention, in part, to our testimony, which I did not read, which discussed in detail a number of the initiatives the Department of Energy undertook after the Rabinow report.

For example, regarding the discussion which has just taken place, the Department of Energy established an ongoing process prior to the advent of Public Law 95-507. We believe that an ongoing process has been effective——

Mr. **LaFalce**. Department of Energy, or Department of Defense?

Mr. **Rauch**. I am talking about the Department of Energy, which I represent. We believe the going process, which we established at our own initiative, clearly is an effective one and a way of improving our performance in the small business program area. We have some concerns, obviously, about proliferation of goals which become rather difficult to work with as a pragmatic point; but we believe that a program such as the one discussed in several of these bills might well be considered within the context of the Public Law 95-507 ongoing procedures and process.

I also in my summary indicated the fact of the matter is within the Department, at least since its inception, we have increased our goals each year and have, in fact, exceeded them in every case. So I believe our record is reasonably good in that context. A given program with a particular programmatic advocate doesn't go forward, I cannot and am not personally informed as to the reasons such a program was not approved.

However, the Department, also in the same timeframe, established what we called an unsolicited proposal reserve initiative. While small, clearly it was an initiative where, we, in fact, negotiated with the program offices an amount of money reserved for unsolicited proposals submitted by small or disadvantaged businesses. In our case, such as occurred from other witnesses here, we built into that process the flexibility, for example, if sufficient meritorious proposals were not received sufficiently in time within a fiscal year, the funds then were released in an adequate timeframe so that other meritorious work could be funded. I think those are the kinds of problems you have heard about already. So I think that is the kind of response I would submit in response to Mr. Blase's letter.

Mr. **LaFalce**. What is the projected funding for these programs?

Mr. **Rauch**. On the particular one I was addressing, the unsolicited proposal program, it is approximately $1 million.

Mr. **LaFalce**. What is $1 million as a percentage of the whole?

Mr. **Rauch**. I said at the outset I thought it was a very small program. When we look at our R. & D. budget and withdraw from it the unsusceptible dollars, for example, in operating a defense weapons research and development facility, Government-owned facility, or operating a national laboratory, after one removes those dollars in fiscal year 1980, the remaining R. & D. obligations in that year were approximately $1.3 billion. Of that amount, slightly in excess of 9 percent was awarded to small business firms at the prime contract level.

Mr. **Bedell**. Mr. Chairman, are you saying you had $1 billion and 90 percent of that went to small business?

Mr. **Rauch**. No, sir, I said slightly over 9 percent.

Mr. **Bedell**. Nine percent?

Mr. **Rauch**. Yes, sir.

Mr. **LaFalce**. We could go on.

Mr. **Bedell**. Could I ask——

Mr. **LaFalce**. One last question.

Mr. **Bedell**. I know you are running short of time. But one of the problems we face on the committee, and you need to understand, particularly the Department of Energy, is that your testimony on page 10 clearly defines part of the problem. Your testimony says that you are concentrating your energy research and development upon large projects such as nuclear physics, magnetic fusion, and this sort of thing. And your R. & D. dollars will decline, particularly in fossil conservation and renewable energy programs, thus the opportunity for small businesses decline.

I have to tell you that some of us, and I am one of them, first of all, think your priorities are crazy. That we have a real opportunity in renewable energy. I have visited some of those projects. I know that you canceled projects without even looking at the files to see if they have any opportunities or not. One way we can maybe move you in the direction that at least this Member feels makes some sense would be to mandate that there is going to be some of this research going in those areas which at least some of us think have tremendous opportunity.

And one thing sure, the people that are doing that work are much more in need of capital than those people who are doing this big research, such as Westinghouse and those types of organizations. You know, you just have to know that some of us just think you are off your rocker the way you are headed, frankly, over there in the Department of Energy.

Mr. **LaFalce**. I think with that statement it is time to bring this panel to a close.

Mr. **Rauch**. I am glad I don't have to decide what kind of rocker I am off.

Mr. **LaFalce**. Gentlemen, I want to thank you very, very much. Sincerely, I do look forward to working with you as we attempt to come up with legislation that hopefully will have the support of the administration. If not, we will then at least be able to implement it successfully even over the administration's objections.

Thank you very much.

We will now call upon Newton O. Cattell, on behalf of the Association of American Universities and the National Association of State Universities and Land Grant Colleges.

TESTIMONY OF NEWTON O. CATTELL, ON BEHALF OF THE ASSOCIATION OF AMERICAN UNIVERSITIES AND NATIONAL ASSOCIATION OF STATE UNIVERSITIES AND LAND GRANT COLLEGES

Mr. CATTELL. Good afternoon, Mr. Chairman. I am Newton Cattell, executive director for Federal relations at the Association of American Universities. I am honored to appear today to present testimony on the Small Business Innovation Act. I do this on behalf of the AAU and the National Association of State Universities and Land Grant Colleges. Our associations represent the principal research universities of America. The principal missions of these institutions are to educate the youth of America, and to conduct most of the Nation's basic research. We are grateful for this opportunity to testify.

I would like to summarize and recast our formal testimony with the following brief comments. I will restrict them to just a few minutes. It has been difficult, indeed, sir, and frustrating for our associations to prepare a position on this legislation. On the one hand, who can oppose innovation? We all know the laudable record of small businesses on that score. If the marketplace doesn't work properly, small businesses perhaps do need a Federal subsidy.

On the other hand, basic research—the discovery of new knowledge—is the grist of future innovation and this bill, I fear, jeopardizes the basic research budgets of the various Federal agencies. Therefore, we request the opportunity, Mr. Chairman, Mr. Bedell, to work with you and your staffs to devise ways of accomplishing your purposes without reducing Federal support for basic research; for I think it would be unfortunate indeed to sacrifice tomorrow's innovative capacity to today's SBIR's.

To document my point, I would like to look first at the National Science Foundation and National Institutes of Health. Assuming an average research project in those agencies is worth $100,000, and that is probably close, at 1 percent, NSF will lose approximately 100 research projects and NIH 300 or more. One of those may help cure cancer or make useful fusion energy a practical possibility. We take a great risk, I think, when we jeopardize those budgets.

Then what of the so-called mission agencies? Basic research supported by those agencies will suffer by a great deal more than 1 percent, 2 percent, or 3 percent depending upon which of these bills ultimately pass. The committee members are aware, I trust, that relatively small agency research budgets tend to be elastic while relatively large development budgets tend to be inelastic. In common terms we could say that basic research is controllable, while development is uncontrollable.

A 1-percent tax on an agency's R. & D. budget will come largely from the research budget. Considering its overruns on the Shuttle, for example, NASA will find its 1-percent SBIR tax in the space sciences budget, not in Shuttle development. Space sciences may lose 10 percent or more, not the 1-percent minimum projected in this legislation. By the same token, basic energy research could lose out to the breeder reactor, and defense sciences to the MX missile. The SBIR tax will be visited, we fear, in larger measure on basic research than on other aspects of agency research and development.

It is unclear in this legislation whether agencies will grant funds to small businesses so that they may conduct basic research. We indicate in our formal testimony that basic research set-asides for performers who are not required to enter peer review competition is, we think, poor public policy indeed. We recommend strongly that small businesses compete with other performers one on one for basic research projects.

The principal issue then for our perspective is the potential attrition of agency basic research budgets. We hope the committee will find a way to give much needed support to small businesses without sacrificing our future innovative capacity. And, Mr. Chairman, we are indeed prepared to help. We have language that I think will protect basic research without depriving small businesses of their entitlements under this act.

I thank you very much.

[Mr. Cattell's prepared statement follows:]

Prepared Statement of Newton O. Cattell, Executive Director for Federal Relations, Association of American Universities

Mr. Chairman, members of the Committee, I am Newton O. Cattell, Executive Director for Federal Relations at the Association of American Universities. I am honored to appear today to present testimony on the Small Business Innovation Act on behalf of the Association of American Universities and the National Association of State Universities and Land Grant Colleges. Our associations represent the principal research universities of America. One of the principal missions of these institutions is to educate the youth of America, and to conduct the preponderance of the nation's basic research. We are grateful for this opportunity to testify.

Our Associations are pleased to support the objectives of the Small Business Innovation Act. Universities and small businesses are linked together in developing innovative new products, processes and services for America. Universities produce new knowledge and educate the manpower which small businesses use to convert that knowledge into marketable goods and services. We gladly endorse efforts to expand the innovative capacity of small businesses.

Although we support the objectives of the bill—to support innovation and the commercialization of research findings—we would have very serious reservations about the legislation before the Committee if it were the Committee's intention to carve out a portion of each agency's basic research budget in order to support basic research in small businesses. It is established public policy to grant research support to the most qualified performer on the basis of open competition. We support that policy. Our members would actively oppose efforts to compromise that principle.

We have been shown that the issue, fortunately, is not one of principle because the funds that would be drawn from each agency's research budget would be used for Small Business Innovative Research Programs (SBIR's) and not for the purposes, such as basic research, that the Congress initially intended those funds to be used. Small businesses would use the money for what they do best—generate and commercialize new innovations. If our understanding of the SBIR legislation is correct, it would tax each agency's R & D budget for a new public purpose; it would not create a pocket of research funds cloistered from open competition.

We appear, then, not because we are outraged over principle. We appear instead because we fear that basic research in our country will suffer—and suffer by a great deal more than 1 percent. The Committee members are aware, I trust, that relatively small agency research budgets tend to be elastic while relatively large development budgets tend to be inelastic. In common parlance, basic research (which by definition does not have practical utility as its principal goal) is controllable, while development is uncontrollable, or at least less controllable. A 1 percent tax on an agency's R & D budget will come largely from the research budget. Considering its overruns on the Shuttle, for example, NASA will find it's 1 percent tax in the space sciences budget, not in Shuttle development. Space sciences may lose 10 percent or more, not the 1 percent projected in this legislation. By the same token, basic energy research could lose out to the breeder reactor, defense science to the MX missile. The SBIR tax will be visited in larger measure on basic research than on other aspects of the research and development process.

Basic research findings are the basis for future innovation. It would be unfortunate indeed to sacrifice tomorrow's innovative capacity to today's SBIR. The two must progress in concert.

The issue, then, Mr. Chairman, is the potential attrition of the basic research budgets of government agencies. SBIR's regularly authorized and appropriated the way programs are supported in NSF may be the best of both worlds. Perhaps there are other ways to accomplish the purposes of the bill. We will be glad to work with the Committee if our contributions can be helpful. The members of our associations are grateful for this opportunity to testify. We hope the committee will find a way to give much needed help to small businesses without sacrificing our future innovative capacity.

Mr. LAFALCE. Because of the pressures of time I am not going to ask any questions of you. We are going to keep the record open because we do intend to ask questions of all the witnesses, in writing, that we didn't get an opportunity to ask today. With that guidance, Congressman Bedell, any questions?

Mr. BEDELL. That sounds like a mandate from the chairman. The only concern I would have, Mr. Chairman, if you cut the budget, you are saying basic research is going to be affected in the same manner, are you not?

Mr. CATTELL. Oh, if you cut the budget, certainly basic research will be affected, as all others.

Mr. BEDELL. No; basic research will be the one that will be primarily affected.

Mr. CATTELL. We face that risk indeed, sir.

Mr. LAFALCE. Thank you very much. And thank you very much, Mr. Cattell.

Mr. CATTELL. Thank you.

[Material received for insertion in the hearing record follows:]

aamc association of american
medical colleges

Statement of the
Association of American Medical Colleges
on
"The Small Business Innovation Research Act"
H.R. 3091, H.R. 4326, H.R. 4343 and H.R. 4373

The Association of American Medical Colleges (AAMC) appreciates this opportunity to sumbit its views regarding the various measures before the Subcommittee designed to stimulate innovation by guaranteeing small business a share of Federal research and development monies. Each bill would require the establishment of small business innovation research programs in all Federal agencies with research and development budgets in excess of $100 million. These programs would be similar to the Small Business Innovation Research (SBIR) program now operating under the aegis of the National Science Foundation and would be funded eventually from an allocation of from 1 to 3 percent of each participating agency's budget.

Since its founding in 1876, the Association has steadily expanded its horizons so that today it represents the whole complex of individual organizations and institutions charged with the undergraduate and graduate education of physicians. It serves as a national voice for 126 accredited medical schools and their students; more than 400 of the major teaching hospitals in the United States; and over 70 academic and professional societies whose members are engaged not only in medical

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school teaching and patient care but also in biomedical research. Consequently, the AAMC is deeply concerned with the fair and wise administration of the Federal biomedical research enterprise and the purpose of these research programs---improvement in the health and well-being of the American people.

The fostering of small businesses is a laudable goal. However, the Association questions the appropriateness of utilizing the mechanism proposed---set asides---in order to achieve this goal. The adoption of set-asides for small businesses would circumvent the traditional policy of awarding Federal research funds on the basis of the technical merit of the work proposed and the competence of the performer. What this would mean for the National Institutes of Health (NIH), the Federal research sponsor with which the Association's constituents are most deeply involved, is that rather than judging all applicants for grant support in a particular area of endeavor against a uniform standard of excellence, which recognizes only quality, originality and relevance to the public health mission of the institutes, applicants from small business firms would be subject to a separate application and award process, protecting them from competition with the rest of the applicant pool, and establishing a dual standard for the awarding of Federal research and development funds---a radical and undesirable departure from current practice.

The last half century has seen a remarkable shift in the world's intellectual center of gravity for science. Until World War II, leadership in virtually all fields of scientific endeavor was clearly

European. One need only recall that the development of atomic weapons by the United States was almost entirely derived from the work of, inspired by, and directed by either European nuclear physicists such as Enrico Fermi from Italy and Neils Bohr from Denmark, European refugees such as Leo Szilard from Hungary and Albert Einstein from Germany and Switzerland, or European-trained such as Robert Oppenheimer. Atomic weapons were the outgrowth of the whole evolution of modern physics developed largely in Europe by giants such as Lord Rutherford, Bohr, Planck, and Heisenberg. During the nineteen twenties and thirties, the tradition was for the brightest young American scientists in all fields of science to go to European universities for pre and/or post-doctoral training. But between 1940 and 1950, an abrupt reversal occurred with the intellectual leadership in science moving to the United States. Since that time, a steady stream of Nobel awards attests to this Nation's continued preeminence.

The overwhelming consensus in the scientific community is that the stature of the United States, at least in the biological and medical sciences, is attributable to two factors. The first is generous Federal support for science, especially basic scientific research; the second is the system created for selecting the recipients of funds, based on the criterion of excellence, as determined by a jury of peers. It should not come as a surprise that, after a period of thirty years, during which hundreds of thousands of scientists have run the gauntlet of peer review, criticism of the process should have emerged. But it is critical to remember that the criticisms are not directed at the criterion of excellence, nor at the process of peer review per se, but rather at aberrations in the operation of a system run by fallible human beings. The Association would guess that more than 95 percent of the members of the biomedical-science community endorse the system currently in use and would freely admit that they can conceive of none better.

The Association firmly believes that applicants from small business firms should compete under the same ground rules, against the same criterion of excellence, before the same peer groups, as all other scientists. If their proposals are sufficiently meritorious, they should be funded. If not, they should be accorded the same treatment as any other proposal, namely, either outright disapproval or approval without funding because of insufficient appropriations. To set aside a specific pool of funds exclusively for applicants for small business firms would suggest *a priori* that these scientists could not otherwise compete successfully. The diversion of funds from high to lower quality projects, an inevitable consequence of this set-aside proposal would be especially unwise at a time in which Federal funding is spartan and appropriations inadequate to take care of even very high research proposals.

Further, the taxpayers deserve more for their hard earned dollars than the expenditure of Federal funds on research projects of lesser quality. Any fixed percentage of funds ear-marked to support research conducted by a particular category of performer must be arbitrary as there is no possible way to estimate, in advance, such a group's capacity to responsibly utilize federal research dollars. The potential for waste, because a set-aside presumes this capability, should be obvious. If the NIH is forced, by enactment of this legislation, to dole out a specific percentage of funds to small businesses regardless of the number and quality of proposals submitted, less than optimum use of the funds is likely. This concern is exacerbated by the fact that all the legislative proposals involve ear-marking amounts above and beyond funds awarded through the normal competitive or single source selection processes and that, as hearings in both the Senate and House have made clear, there is a very real possibility that the amount of a set-aside would be raised once the precedent for it has been established.

Until recently, access of small business firms to funds appropriated to the NIH for research was restricted to those designated for contracts, as a result of the Public Health Service (PHS) policy of not awarding grants to profit-making corporations. The PHS has recently announced that it has abandoned that policy and is at the very moment in the process of developing appropriate grant regulations governing applications from for-profit firms. With this roadblock removed, there is no longer any access barrier to grant funds. Further, a formidable obstacle faced by small firms submitting modest unsolicited contract proposals---the complex and ponderous processes involved in compliance with the Federal procurement regulations for contracts---essentially disappears under the new policy allowing for-profit entities to apply for research grants.

One of the recurrent themes articulated by advocates of the "set-aside" is that, without it, small business will be unable to secure their fair share of Federal R&D funds because of the inherent anti-small business bias of Federal bureaucrats or the Federally-managed peer review system. The extent, or even the existence, of such bias within the NIH or its peer review system cannot presently be assessed, since, in the past, unsolicited R&D proposals from small business could not, dejure, be processed for grant awards. Now that that access to grant funds has been opened, germane experience will accrue and can be examined for evidence of bias. Should such evidence emerge, appropriate corrective actions other than establishment of a set-aside can and should be taken.

In this connection, it might be noted that charges of bias originate most frequently with disgruntled applicants whose requests for funds fail to win approval through the peer review system. Charges of bias against certain regions of the country, against certain classes of institutions, against certain disciplines, against innovative ideas, against human research, against animal research, etc., etc., have all been leveled at one time or another at the NIH peer review system that, over the last almost 40 years, has processed several hundreds of thousands of applications and disapproved about half as unworthy of support. The Association thinks it fair to say that none of these charges has ever been convincingly sustained. The NIH peer review system is viewed by the great majority of productive American bioscientists as fair, just and equitable.

The Association assumes that the system will deal as fairly, justly and equitably with applications from small business firms as it does with those from universities, hospitals and research institutions. Certainly, there is no basis for the supposition that scientists in small business enterprises would be disadvantaged in any open competition simply on the basis of size. Investigators from small colleges, universities and research institutes succeed quite well in capturing

NIH funds. Nor is there reason to suspect that NIH will discriminate against small firms on the basis of their financial underpinnings. The recent change in PHS policy opening grant eligibility to for-profit concerns is evidence of recognition that industry has a role to play. In the face of the historical reverence for quality that has characterized NIH stewardship of public funds, the Association thinks it overwhelmingly reasonable to assume that, once granted access, small businesses will be successful in garnering NIH awards to the full extent that their proposals meet the criteria that the NIH has traditionally demanded.

Also relevant here is the fact that NIH's record of funding small businesses through the avenue open to it---contracts---is quite respectable. Eight and one-half percent of NIH's R&D contract budget (20% of contract expenditures going to for-profit concerns) went to small firms in fiscal year 1980. This was achieved despite the obstacles involved in the funding of unsolicited contract proposals and despite the fact that a significant portion of the NIH contract budget covers clinical trials---experimental procedures in which small business simply cannot engage due to the large number of subjects and extensive hospital and laboratory facilities involved. The Association believes this record provides ample evidence not only of NIH's ability and willingness to "play fair" but also its commitment to finding the best possible performers to carry out its mission.

The position of the AAMC---that applicants from small business firms should compete under the same ground rules, against the same criterion of excellence, before the same peer groups, as all scientists---implies no *a priori* level of NIH funding going to the small business sector. These concerns should receive as much support as they can legitimately win in the competitive process. On the other hand, the sequestering of any amount of funds for selective distribution outside the arena of general competition is, as noted earlier, an unwise public policy. The Association is distressed at the prospect of ear-marking 1 to 3 percent of R&D budgets of agencies such as the NIH; but the spectre of 15 percent---as proposed in H.R. 5607 last year and in H.R. 11 currently---or more---as has been suggested both by members of Congress and by witnesses before the House and Senate---is too distressing to even contemplate. Despite the impossibility of guessing the amount of funds warranted for a particular group of performers, the Association is convinced that there is no reasonable system of values and priorities that would justify allocation of such a significant amount of biomedical and behavioral support for profit-making performers and no conceivable way that such firms could use the money responsibly. Industrial innovation with its focus on product development and product improvement is a far different quest than the creation of new basic knowledge that is the primary mission of NIH. A set-aside of a magnitude much over the amounts contemplated in legislation before the Subcommittee would absolutely wreak havoc with the NIH's ability to carry out its agenda.

The contributions of small businesses to the transformation of scientific progress into practical products and services are an essential component of the Nation's progress in meeting the health needs of its citizens. However, the measures at hand blur the important and real distinctions between the aims and interests of small businesses and the program of scientific innovation being carried out under the aegis of the NIH. In tune with the long-standing tradition of America's free enterprise system, the AAMC believes that Federal assistance for the product development activities of for-profit concerns should be dealt with through the traditional mechanisms of support to commercial enterprises---loans, subsidized loans, loan guarantees, tax incentives, etc. If scientists in such enterprises want to pursue the type of research endeavors traditionally undertaken by not-for-profit concerns, they should be subject to the same standards, policies and procedures all other investigators applying for Federal support.

The opening up of competition for grant funds to commercial outfits seems to the Association to represent a very satisfactory solution in the domain of biomedical and behavioral research to the problem of supporting R&D in small business firms. Under this policy, the existing exemplary system for fair and equitable allocation of limited Federal resources to the most competent performers through open competition, judged by peers can be preserved. In the Association's view, legislation to create a special "set-aside" for small business is not only unwise and contrary to the public interest; it is also completely unnecessary.

SOME STUDIES SHOWING THE SOCIO-ECONOMIC IMPORTANCE AND CURRENT STATUS OF SMALL BUSINESS INNOVATION AND SMALL SCIENCE AND TECHNOLOGY BASED FIRMS

1. The Job Generation Process, David L. Birch, M.I.T. Program on Neighborhood and Regional Change (study done for U.S. Department of Commerce), Cambridge, Massachusetts, 1979.

   Small concerns with 20 or fewer employees created 66 percent of all net new jobs in the private sector between 1969-1976. In addition, 80 percent of new jobs came from businesses less than five years old. The same study showed that 87 percent of new jobs came from firms with 500 or less. The study is based upon a sample of 5.6 million businesses.

2. Canadian Federation of Independent Businesses Study:

   Small businesses with 20 or less employees created 72 percent of all new jobs in Canada between 1969-1977. During this same period, these small firms created 317,000 jobs in manufacturing while those employees show a loss of 124,000 jobs.

3. Market Structure and Technological Performance in the Food Manufacturing Industry. Williard F. Mueller, John Culberton, and Brian Packham, University of Wisconsin-Madison, Final Report Under National Science Foundation Grant No. APR 76-03789, September 1979:

   Examination of the sources of inventions in six food manufacturing industries shows that the great majority (90 percent) of mechanical invention (as measured by patents) relevant to these industries, originated outside the industries, less than one-half of the rest originated with the four leading firms in each industry (P. 111).

   The authors also studied "origins of important innovations influencing productivity of food manufacturers," using the Putman Food Awards given annually by Food Engineering as a direct index of meaningful innovation.

   Putman Awards are given for those innovations that most improve the efficiency and effectiveness of food processing and manufacturing. Awards are made on the basis of three considerations: the novelty or innovation factor, the breath of application in the food industry, and the significance to the industry. "The most striking feature of the size distribution of Putman Award recipients is that awards were received by corporations covering a broad spectrum of sizes, with the majority received by very small firms. About one-half of all domestic, non-government Putman Award recipients were very small business units (sales below $10 million)."

4. M.I.T. Development Foundation Study, "The Role of New Technical Enterprise in the U.S. Economy," John O. Flender and Richard S. Morse, 1975.

Sixteen highly successful industry leaders were divided into three categories to compare growth in employment and tax revenues to that of sales over the five year 1969-1974 period. The categories and firms were:

Mature Companies: Dupont, General Electric, Bethlehem Steel, General Foods, International Paper, and Proctor and Gamble.

Younger Innovative Companies: Polaroid, 3M, IBM, Xerox, Texas Instruments.

Young Technology Companies: Data General, National Semiconducter, Compugraphic, Digital Equipment, and Marion Laboratories.

The findings of that study were as follows:

Young technology companies with sales equaling only two percent of those of the mature industry leaders created 34,369 new jobs or 34 percent more than the 25,558 new jobs created by the mature companies.

Total employment in the mature firms increased at only 3.2 percent over the five years compared to 23.7 percent for the innovative companies.

The innovative companies provided nearly $2.3 billion of income tax revenues compared to $1.5 billion for the mature companies, or 34 percent more taxes.

The same study expresses concern over the sharp reduction in new small company public underwriting offerings of equity securities of less that $5 million for companies with a prior net worth of less than $5 million.

Small Technical Firms
Total Dollar Amount

($ in Millions)	($ Million)	Number of Offerings
1969	$1,367	698
1970	375	198
1971	551	248
1972	896	409
1973	158	69
1974	16	9
1975	16	4
1976	145	29
1977	188	30

5. American Electronics Association Study, Testimony before U.S. Senate Select Committee on Small Business by Dr. Edwin Zschau, February 1978.

Companies responding to this extensive industry survey were divided by age into four categories:

Mature - more than 20 years old

Teenage - 10 - 20 years old

Developing - 5 - 10 years old

Start-up - less than 5 years old

The survey showed that:

The employment growth in Start-up companies was 115 times greater than for Mature companies in 1976.

It was 55 times higher in Developing companies.

And 20 - 40 times higher in Teenage companies than in Mature Companies.

Although the Mature companies had, on the average, 27 times more employees than the average of all firms founded since 1955, in 1976, the newer companies created an average of 89 new jobs per company. During this time, Mature companies created an average of only 69 new jobs per company.

6. U.S. Office of Federal Procurement Policy, Office of Management and Budget, Small Firms and Federal R&D, 1977.

Small firms have compiled a striking record of innovation in the private sector. Firms with less than 1,000 employees accounted for almost one-half of major U.S. innovations during the period 1953-1973.

The ratio of innovations to R&D employment is four times greater in firms with less than 1,000 employees than in larger firms.

In spite of the above record in innovation and lower cost, small business receives only 3.5 percent of total Federal R&D.

7. U.S. Department of Commerce Study, Technology Innovation: Its' Environment and Management (Charpie Report), 1967.

The Secretary of Commerce convened a distinguished panel under Robert Charpie to consider the main factors affecting invention and innovation. Some conclusions were:

A handful of companies with 5,000 or more employees performing almost all industrial R&D, but this was not necessarily indicative of innovation performance.

In analyzing many studies, they found that independent inventors and small technology based companies are responsible for a remarkable percentage of the important inventions and innovations of this century, a much larger percentage than their relative investment in R&D would suggest. These include:

The Jewkes Study on 61 important inventions and innovations in this century, over one-half came from small firms and independent inventors.

The Hamberg Study (University of Maryland) of the 1946-1955 decade found that over two-thirds of the major inventions resulted from the work of independent inventors and small companies.

Professor Hamberg also studied 13 major innovations in the American steel industry. Four came from European companies, seven from independent inventors, none by American steel companies.

The Peck Study (Harvard) of 149 inventions in the aluminum industry found that major producers accounted for only one of seven imporant inventions.

The Enos Study (M.I.T.) considered seven major inventions in the refining and cracking of petroleum. All seven were made by independent inventors. The contributions of large firms were largely in the area of improvement inventions.

They emphasized the importance of small company environment in innovation, of the large company in improving upon existing innovations, and that R&D expenditures do not necessarily correlate with obtaining innovation.

8. National Science Foundation, Science Indicators 1976, National Science Board, 1977.

   On the basis of samples of major innovations introduced to the market between 1953-1973, small firms (with up to 1,000 employees) were found to produce about 24 times as many major innovations per R&D dollar as large firms (over 10,000 employees) and four times as many as medium-sized firms.

   Six industries accounted for over 85 percent of total U.S. industry R&D spending in 1974. Just 20 companies conduct 53 percent of all U.S. industrial R&D, 309 companies conduct 84 percent of the total. (Ed. note - Most of these firms, unlike small businesses, are multi-nationale).

   The most frequently cited source of the technology underlying major inventions was applied research, most of which was performed within the innovating company. Second in frequency was basic research, most of which, however, was internal.

   Public funds assisted in the development of 24 percent of the sample innovations from the most R&D intensive industries; 36 percent of those innovations were from non-manufacturing industries.

   Sixty percent of the inventions underlying major innovations occurred in the profit center that produced the innovation, and an additional 25 percent was initiated elsewhere within the same enterprise. Independent inventors and universities contributed less frequently.

   Our advanced technology is concentrated in a few high-technology and/or capital-intensive firms. It is not well diffused throughout medium and small sized companies. Our study shows that, without some added impetus, the advanced technology will not expand or diffuse widely to small or medium sized firms...

Some reorienting or rethinking of Federal policy toward funding the science and technology base may be appropriate ... Federal financing of applied R&D, in support of commercial technology, should be considered in the context of potential economic and social benefits to the Nation and in relation to the private sector's ability and motivation to invest its own resources, as well as in relation to other government initiatives that can influence the climate for private sector innovation.

NATIONAL SCIENCE FOUNDATION
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NSF MAKES SMALL BUSINESS INNOVATION RESEARCH AWARDS

The National Science Foundation (NSF) announced 85 awards totaling $2.4 million to small science- and technology-based firms. The awards which were made through the Foundation's Small Business Innovation Research (SBIR) program recognize the role such firms play in research and its conversion into technological innovation in the economy. The program is designed to increase the public return on investment from Federally funded research.

The primary aim of the SBIR program is the support of advanced research on important scientific and engineering problems and opportunities that could lead to significant public benefit if the research is successful. A second important goal is the conversion of NSF supported research into industrial applications and technological innovation where appropriate. To accomplish this, the program's design encourages the small firm to pursue potential commercial applications of the Government research with follow-on private venture capital. Federal funds only support research consistant with NSF program objectives.

A total of 696 proposals were received under the 1981 SBIR program from 43 states and the District of Columbia. Firms receiving awards ranged from a start-up one-man firm to a company with 425 employees.

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The 85 awards were made for advanced research in the following areas of potential application: materials; bio-sources of materials; advanced manufacturing processes; advanced chemical processes; industrial biological processes; microelectronics; communications and systems; computer science and engineering; robotics and controls; scientific and industrial measurements; radiation processing and control; light machinery and components; advanced automotive research; food process engineering; marine resources; mineral resources; environmental technology; tunneling; earthquake engineering; and science and technology ot aid the handicapped.

The awards are for phase I of the three-phased SBIR program. These awards are for up to $30,000 and six months to determine, as much as possible within these limitations, whether the research idea appears technically feasible and whether the small firm can do high-quality research before further government support takes place.

Phase II is the principal research effort for those projects appearing the most promising after the first phase. These awards have averaged $200,000 for 1-2 years. Phase III involves the follow-on private funding from venture capital or large industrial firms to pursue potential commercial applications of the government-funded research. No government funds are provided in phase III. As a result of the first SBIR solicitation, however, more than $23 million from private sources has been obtained by the small companies to date to continue the NSF research into industrially relevant applications. Firms that have completed phase II also have more than doubled their employment on the average since they submitted their phase I proposal.

In the first SBIR solicitation in 1977-78, NSF funded OMEX, a small California firm, in laser optics research for $173,000. This led to the company's obtaining $5 million from a venture capital firm to pursue large scale computer storage applications of the NSF research. More recently the firm obtained an additional $4 million from a major title insurance company to produce full-scale hardware. If successful, the research may have made a significant contribution to the promising new field of large-capacity electronic filing and information storage.

Similarly, Terra Tek, Inc., a small Utah firm was funded for research on measuring metal fracture toughness. The company went on to develop an instrument to measure the fracture toughness of mining and petroleum drill bit components. This instrument is now being manufactured in the U.S. by Terra Tek and has sales world-wide. Terra Tek is now developing a full-line of measure metal fracture toughness instruments for use in many other important fields where such measurements previously were not economically feasible.

Collaborative Research, Inc., a small Massachusetts firm, was funded in 1977 for genetic research to enhance animal protein production. This research resulted in the company obtaining $5 million of follow-on investment from a major U.S. chemical firm.

The SBIR program also stimulates technology transfer of government research to the private sector as an integral part of the research process, rather than after R&D has been completed or a product produced for government use.

A complete list of companies receiving awards is attached.

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NATIONAL SCIENCE FOUNDATION

SMALL BUSINESS INNOVATION RESEARCH PROGRAM

PHASE I AWARDS - SEPTEMBER 1981

Firm	Location	Project Title
Topic 1 - MATERIALS RESEARCH		
1. Spire Corporation	Bedford, MA	Ion Beam Deposition of Cubic Boron Nitride As a Hard Coating from Borazine
2. Center for Innovation, Inc.	Butte, MT	Centrifugal Plasma Furnace
3. Fiber Materials, Inc.	Biddeford, ME	Investigation of Fiber-Reinforced Microcracked Ceramics
4. Solarex Corporation	Rockville, MD	Chemical Vapor Deposition of Amorphous Silicon
5. Ceramic Finishing Co.	State College, PA	Grain Boundary Phases for Structural Ceramics
Topic 2 - BIO-SOURCES OF MATERIALS		
6. SISA Inc.	Cambridge, MA	Antifungal Constituents of Rhamnus Prinoides
7. Ecoenergetics, Inc.	Fairfield, CA	Chemicals From Halophilic Microbes
8. Covalent Associates	Framingham, MA	Electrocatalytic Reduction of Lignin to Phenolic Feedstocks
9. Plant Resources Institute	Salt Lake City, UT	In Vitro Production of Saltbush for Revegetation and Range Improvement
10. BioChem Technology Inc.	Malvern, PA	Production of Cellulose Powders Using Cellulase Enzymes
Topic 3 - GENETIC TECHNOLOGY		
No Awards		

Topic 4 - ADVANCED MANUFACTURING PROCESSES

11. Magnasonics, Inc.	Albuquerque, NM	Electromagnetic Transducers for Weld Inspection
12. Hahn Associates	Northboro, MA	Computer Control for Small-Hole Grinding
13. Pritsker & Associates	West Lafayette, IN	Development and Identification of Operations Research Algorithms for Small Computers
14. Flow Technology Co.	Kent, WA	Abrasive-Waterjet Metals Cutting
15. U.S. Automation Co.	Warren, MI	Thermastress Concept for Steel Reinforcing Wire Manufacture

Topic 5 - ADVANCED CHEMICAL PROCESSES

16. Merix Corporation	Babson Park, MA	A New Class of Separating Agents
17. Andrulis Research Corp.	Bethesda, MD	Hybrid-Phase Catalysts for the Oxidation of Phenol to Benzoquinone
18. Castle Technology Corp.	Woburn, MA	Electrochemical Production of Ozone
19. Electrochimica Corp.	Mountain View, CA	Non-Noble Metal Electrocatalysts

Topic 6 - INDUSTRIAL BIOLOGICAL PROCESSES

20. Collaborative Research, Inc.	Waltham, MA	Optimization and Automation of Gene Synthesis
21. Bio-Metric Systems, Inc.	Navarre, MN	Competitive Inhibitor-Enzyme Immunoassay
22. SISA Inc.	Cambridge, MA	Antibiotics from Isopods
23. Bonneville Scientific	Salt Lake City, UT	Acoustic Protein Separation

Topic 7 - MICROELECTRONICS

24. Mathematical Sciences Northwest, Inc.	Bellevue, WA	Soft X-Ray Source for Microlithography
25. Advanced Research and Applications Corp.	Sunnyvale, CA	High-Throughput Line-Source Electron Beam Processing of Silicon-on-Insulator Structures for Microelectronics
26. Scientific Research Associates, Inc.	Glastonbury, CT	Transient Three Dimensional Numerical Simulation of Microelectronic Semiconductor Devices

Topic 8 - COMMUNICATIONS AND SYSTEMS

27. Cyclotomics, Inc.	Berkeley, CA	Coding for Band-Limited Channels
28. Spire Corporation	Bedford, MA	Electrostatically Bonded Fiber-Optic Coupler
29. ALPHATECH, Inc.	Burlington, MA	On-Line Tool Wear Estimation and Failure Prediction in Metal-Cutting Operations
30. Scientific Systems Inc.	Cambridge, MA	Advanced Control of Electric Arc Furnaces
31. Systems Engineering for Power, Inc.	Vienna, VA	Variable Structure Servomechanisms

Topic 9 - COMPUTER SCIENCE AND ENGINEERING

32. Computational Mechanics Consultants, Inc.	Knoxville, TN	Array Processing of the Three-Dimensional Navier-Stokes Equations
33. Relational Technology, Inc.	Berkeley, CA	Distributed Database Management on Local Networks
34. Tractell, Inc.	Dayton, OH	Optical Image Analysis of VLSI Microcircuits
35. King Research, Inc.	Rockville, MD	Structure, Accessing, and Manipulation of Numeric Data Bases

Topic 10 - ROBOTICS AND CONTROLS

36. Kazuko Enterprises, Inc.	Orlando, FL	Distance Sensor for Robotics
37. Microbot, Inc.	Menlo Park, CA	Servo for Industrial Robot with Force Control
38. Deft Laboratories Inc.	East Syracuse, NY	Robot Vision Techniques Using Acousto-Optic Image Sensors
39. Optra, Inc.	Everett, MA	Robotic Camera Improvements
40. Automatix Inc.	Burlington, MA	Advanced Programmable Grey-Scale Vision for Robotics

Topic 11 - SCIENTIFIC AND INDUSTRIAL MEASUREMENTS

41. Charles Evans & Assoc.	San Mateo, CA	Advanced Detection System for Quantitative Three-Dimensional Ion Microscopy
42. Lake Shore Cryotronics, Inc.	Westerville, OH	Quantum Ferroelectric Pressure Sensor
43. ALM, Inc.	Arlington, VA	Latent Fingerprint Fluorescence By Means of an Acousto-Optic Output Coupled (Cavity-Dumped) Variable Pulse Width Argon-Ion Laser
44. KOR, Inc.	Cambridge, MA	Laser-Based Photoacoustic Method for Measuring Stable Isotope Ratios
45. Aerodyne Research, Inc.	Bedford, MA	Scanning Spectral Correlator
46. Advanced Research and Applications Corp.	Sunnyvale, CA	Compton Backscatter Computed Tomography
47. Spectron Development Laboratories, Inc.	Costa Mesa, CA	Eddy Current Imaging
48. Quantatech International Inc.	Chatsworth, CA	Photon Induced Surface Conductivity Requiring the Presence of Sorbed Photoionizable Species

Topic 12 - RADIATION PROCESSING AND CONTROL

49. Advanced Fuel Research, Inc.	East Hartford, CT	Microanalysis Methods for Inhomogeneous Materials
50. Scientific Measurement Systems, Inc.	Austin, TX	Spatial Resolution in Industrial Tomography
51. Mission Research Corp.	Albuquerque, NM	High Currrent Ion Implantation

Topic 13 - LIGHT MACHINERY AND COMPONENTS

52. Eagle Engineering Inc.	Pittsfield, MA	Direct Action of Electromagnetic Fields on Fluids
53. Solamat Inc.	East Providence, RI	Bearing Structures Fabricated from Arc Plasma Sprayed Layers Coated with Solid Film Lubricants
54. Shaker Research Corp.	Ballston Lake, NY	Self Feeding Fluid-Film Bearing
55. IMEC Corporation	Boston, MA	Improved Dynamic Torque Control of Standard Induction Motors

Topic 14 - ADVANCED AUTOMOTIVE RESEARCH

56. Cambridge Collaborative, Inc.	Cambridge, MA	Application of Resilient Bearings to a Crankshaft of a Diesel Engine
57. KOR, Inc.	Cambridge, MA	Deuterated Additives for Automotive Lubricants
58. Materials Sciences Corporation	Blue Bell, PA	Woven Fabric Reinforced Composites for Automotive Applications

Topic 15 - FOOD PROCESS ENGINEERING

59. Webb Foodlab, Inc.	Raleigh, NC	Effect of Processing Techniques on the Reduction of Cholesterol and Lipids in Muscle Foods

Topic 16 - MARINE RESOURCES

60. Aquatic Farms	Kaneche, HA	Cage Culture of Red Tilapia in Prawn and Shrimp Ponds
61. Abandoned Farm, Inc.	Damariscotta, ME	Stabilizing Canadian Mussel Seed Transplanted into New England Waters
62. Dynalysis of Princeton, Inc.	Princeton, NJ	Modeling the Coastal Ocean - A Step Towards Marine Forecasting Capability
63. Research Planning Institute, Inc.	Columbia, SC	Improved Pond Aquaculture in the American Oyster, Crassostrea Virginica (Gmelin)

Topic 17 - MINERAL RESOURCES

No Awards

Topic 18 - ENVIRONMENTAL TECHNOLOGY

64. JTC Environmental Consultants Inc.	Bethesda, MD	Inhibition of Microbial Growth on Activated Carbon Beds
65. Huey Corporation	Morgantown, WV	Clean Combustion of Oil Shale in Fluidized Beds
66. QED Corporation	Ann Arbor, MI	Inductive Heating of Spent Granular Activated Carbon
67. Flow Technology Co.	Kent, WA	Engineering Development of a Clean Burning Residential Wood Stove

Topic 19 - TUNNELING, DRILLING, EXCAVATION, AND DREDGING

68. Hydronautics, Inc.	Laurel, MD	Self-Resonating High Pressure Water Jets for Tunneling, Excavation & Mining
69. Flow Technology Co.	Kent, WA	Novel Rock Tunneling and Excavation Method

Topic 20 - EARTHQUAKE ENGINEERING

70. Scientific Service, Inc.	Redwood City, CA	Comprehensive Computer-Aided Earthquake Analysis and Program Development for Business and Industry
71. Scientific Measurement Systems, Inc.	Austin, TX	Tomographic Assessment Techniques for Earthquake Engineering
72. Advanced Technology & Research, Inc.	Silver Spring, MD	In-Situ Determination of Damping of Soils
73. Geotechnical Engineers, Inc.	Winchester, MA	Field Index Test for Estimating Liquefaction Potential
74. ANCO Engineers, Inc.	Santa Monica, CA	Seismic Hazard Assessment of Nonstructural Ceiling Components
75. Michael E. Durkin & Associates	Woodland Hills, CA	Alternative Methods for Hazard Reduction in Unreinforced Masonry Buildings

Topic 21 - SCIENCE AND TECHNOLOGY TO AID THE HANDICAPPED

76. Fiber Materials, Inc.	Biddeford, ME	Fatigue Mechanisms in a 3D Carbon-Carbon Composite
77. Advanced Mechanical Technology, Inc.	Newton, MA	Impedance Test for Intramedullary Anchored Femoral Prosthesis Loosening
78. EMV Associates, Inc.	Rockville, MD	Biotechnical Multi-Electrode/Neuronal Interface
79. Time/Space Systems	Endicott, NY	Signal Processing Concept Applicable to Hearing
80. Technology Transfer Concepts International	Neenah, WI	Natural Gum Substitute for Karaya Gum for Ostomy Products

Topic 22 - APPROPRIATE TECHNOLOGY

81. Thomas C. Wilder, ScD	Waltham, MA	Characterization of Three-Metal Galvanic Cells in Seawater
82. Dow Associates, Inc.	Berkeley, CA	Ecological Principles of Stability as a Means of Understanding the Role of Appropriate Technology in Agriculture
83. Snell Environmental Group Inc.	Lansing, MI	Rate of Biodegradation of Toxic Organic Compounds
84. Hydronautics, Inc.	Laurel, MD	Reducing/Separating Recoverable Demolition Wastes with Cavitating Water Jets
85. Cal Recovery Systems, Inc.	Richmond, CA	Integrated Energy-Agro-Waste Systems for Small-Scale Farms

NSF SMALL BUSINESS INNOVATION RESEARCH PROGRAM

Background: The National Science Foundation's Small Business Innovation Research (SBIR) program was initiated to stimulate quality proposals in the NSF program areas to meet the Congressional requirement that a minimum of 10 percent (at the time) of NSF applied research be spent with small business firms. This was equivalent to about one percent of the NSF budget. To reach high caliber small firms and to achieve other objectives, NSF designed a special three-phased program with incentives to particular interest to small science and high-technology based firms.

Description: Phase I supports small up to $30,000 six-month research awards in NSF program areas. This phase is to determine whether the research idea appears technically feasible and whether the firm can do high quality research, as much as is possible within these constraints. Phase II is the principal research project where awards average $200,000 for 1-2 years and funds those proposals found most promising after phase I. Phase III is to pursue potential commercial developments from the government research where possible and is funded entirely with private capital.

Design: The program is designed to increase (1) the opportunity for small high-technology firms to participate in Federal R&D and (2) the conversion of NSF research to industrial application and possible technological innovation in the private sector. It is unique in that it couples Federally funded research in phases I and II to follow-on private venture capital in phase III. Government funds are spent solely on agency objectives; private funding pursues commercial objectives.

The program provides specific incentives for the small firms to pursue the commercial applications. SBIR asks proposers two questions in phase I in addition to those related to agency research needs: (1) Does the proposed research also have commercial potential and (2) Do you intend to obtain private follow-on capital to pursue it? "Yes" answers receive extra points-of-merit in the evaluation process. In phase II, the phase I winners are asked, but not required, to obtain an actual commitment for private funding from a third party for phase III at least equal to that requested from NSF in phase II. Those obtaining such a commitment also receive an extra consideration in the evaluation of their phase II proposal. Phase III commitments are normally obtained from a venture capital or large industrial firm.

This approach utilizes Federal R&D as a base for technological progress in the private sector at little or no additional cost to government. It then utilizes private sector objectivity as to the commercial potential of the research and indirectly for an evaluation of the management, market, and future financial requirements. All of these factors are important to the innovation process. Government is not involved in the private sector analysis or negotiations but, solely in considering the research and any follow-on commitment presented. The extra points-of-merit apply only when proposals are otherwise judged to be of approximately equal technical merit.

Program Objectives

- To increase the opportunity for small high-technology firms to participate in Federal R&D.
- To support quality research of interest to NSF on advanced ideas that are too high risk or long term for small firms to obtain private investment.
- To couple NSF research to follow-on private venture capital or other support.
- To increase technological innovation and commercial applications from government funded research.
- To improve the economic return on investment from Federal research.

Current Status: Four solicitations have been conducted to date. The 1977 solicitation has completed phase II and eight firms are in phase III. The 1979 solicitation is starting phase II. 1980 has just completed phase I and submitted phase II proposals. Finally, Phase I awards have just been made under the 1981 solicitation. It is planned that approximately one-half of those projects found most promising in phase I will be funded in phase II.

Results to Date: The program is highly competitive with over 2000 proposals received and only 286 awards made to date. Proposals have been received from firms in 49 of the 50 states plus the District of Columbia and awards have been made to firms in 36 states and the District as follows:

	Solicitation			
	1977	1979	1980	1981
Phase I Proposals	329	408	530	696
Phase I Awards	42	54	62	85
Phase II Awards	21	13	9 (to date)	

The number of phase II awards in 1979 and 1980 (to date) have been reduced due to budget limitations.

In addition to the research conducted in a wide-range of program areas, the 21 phase II grantees in the 1977 solicitation have received $23 million in private follow-on funding. Major investments have been made in two firms by the Dow Chemical Company and Heizer Corporation, a small business investment company, and smaller ones in six other firms. These 21 firms have also doubled their employment. NSF funding in phases I and II totaled $5.3 million. There have been a number of new firms started as a result of the program and some 15 inventions reported. A number of new products and processes are under development and one instrument to measure the fracture toughness of metal (drilling bits) is already being sold world-wide. An increasing number of industrial and venture capital firms are showing interest in the program as the SBIR topics have become more industrially relevant. (See 1981 SBIR program solicitation)

Coordination: NSF coordinates and cooperates with most Federal agencies with significant R&D budgets. Other agency and university scientists and engineers often review SBIR proposals as do some private sector people. The NSF staff has assisted DOD with its similar Small Business Advanced Technology program and discussed the program with other agencies. (The DOD program involves awards of up to $50,000 in phase I and to $500,000 in phase II with the opportunity for follow-on production contracts in DOD as well as private sector commercialization in phase III.) Senate bill S.881 and companion house bill propose to replicate the program in other agencies with R&D budgets in excess of $100 million.

Proposers also are encouraged to couple to universities such as through consulting arrangements, sub-contracts and the use of special facilities on occasion. Most grantees have done so, particularly utilizing university scientists and engineers as consultants.

October 1981

Roland Tibbetts
Program Manager for Innovation
and Small Business
Division of Industrial Science
and Technological Innovation

NSF SMALL BUSINESS INNOVATION RESEARCH PROGRAM

SIGNIFICANT RESULTS

- Laser optics research was funded with OMEX, a small electronics firm in Santa Clara, Cal. for $25,000 for phase I in 1977 and $147,000 for phase II in 1978. The firm then received $5 million in phase III from the Heizer Corporation, a Chicago SBIC, for application of the research to a new field of electronic filing based upon the potential storage density. OMEX has since signed a $4 million contract to produce the equipment for the nation's largest title insurance company in Los Angeles.

- Genetics research was supported in 1977 with Collaborative Research of Waltham, Mass., to enhance animal protein production. This was well before the Supreme Court decision and subsequent availability of venture capital. This was the company's first genetics research. NSF funding was $25,000 for phase I and $235,000 in phase II. Dow Chemical has since funded $7 million of continuing applications work and the company is currently negotiating a $10-$20 million private placement for up to 20 percent of the company with four large firms.

- To increase productivity, NSF funded Advanced Mechanical Technology of Newton, Mass. for advanced research to implant an isotope on the cutting edge of machine tools for automatic production processes for $25,000 in phase I and $186,000 in phase II. GE, Ford, Chrysler and Raytheon were all interested as were the Japanese. Although no radiation problems are anticipated, the problem of obtaining the approval of the NRC, OSHA and EPA will take two years. Currently a fifth major U.S. industrial firm with plans for a new partially automated factory is interested.

- Research on measuring metal fracture toughness was funded with Terra Tek of Salt Lake City for $25,000 in phase I and $220,000 in phase II. The company has now built an instrument to measure the fracture toughness of drilling bits for mining and petroleum needs, now being sold world-wide. They are also working on other instruments to meet a wide range of applications in many different kinds of metals.

- Soil and Land Use Technology, Inc. of Columbia, Md., received awards to determine the feasibility of introducing foreign food crops into the U.S. which were better adapted to environmental stress such as arid, wet or saline conditions. Their study has become widely known and they have recently received $130,000 from the American Newspaper Publishers Association to pursue kenaf, a hemp-like crop which grows in wet areas, as a possible source of newsprint.

- Three earthquake engineering firms in the Los Angeles area that received grants in phase I formed ABK, a joint-venture, to conduct phase II using the unique capabilities of each firm. The study is probably the most comprehensive and best known to date in the important area of strengthening existing non-reinforced masonry buildings. The results are being implemented in Los Angeles building codes, studied by other cities and states, and professional organizations are using the study to suggest revisions to model building codes which will have world-wide application.

CURRENT STATUS OF NSF FY 1982
AUTHORIZATION AND APPROPRIATION LEGISLATION

NMT = Not More Than

		AUTHORIZATION			APPROPRIATION				
	FY 1982 Revised Request	H.R. 1320 1/ House Committee	S. 1200 2/ Senate Committee (Hatch)	S. 1194 3/ Senate Committee (Packwood)	H.R. 4034 4/ House Act	H.R. 4034 5/ Senate Act	Conference 8/ Recommendation	FY 1982 Carter Request	Reagan Reduction from Carter Request
RESEARCH AND RELATED ACTIVITIES									
Mathematical and Physical Sciences	$ 295.4	$ 295.4	$ 290.41	$ 290.41				301.3	- 5.9
Engineering	102.5	102.6	100.56	100.56				104.6	- 2.0
Biological, Behavioral and Social Sciences	172.0	198.1	171.98	173.98		$184.6 NMT	$ 184.60 NMT	219.0	- 47.0
Astronomical, Atmospheric Earth and Ocean Sciences	253.2	253.2	251.15	251.15				268.0	- 14.8
Ocean Drilling Programs .	26.0	14.0	24.00	26.00	6/	7/	7/	30.0	- 4.0
Antarctic Research Program	70.1	69.6	70.10	70.10				70.1	0
Scientific, Technological and International Affairs	37.7	56.4	35.70	39.70				80.0	- 42.3
Cross-Directorate Programs	-0-	29.7	14.50	10.00				97.9	- 97.9
Program Development and Management	63.2	63.2	62.20	62.20	$ 63.2	$ 63.2	63.20	67.2	- 4.0
TOTAL, RESEARCH AND RELATED ACTIVITIES ...	1,020.1	1,082.2	1,020.60	1,024,10	1,065.0	1,024.1	1,040.00	1238.1	-218.0
SCIENCE AND ENGINEERING EDUCATION	9.9	75.0	20.40	19.90	35.0	19.9	27.45	111.9	-102.0
SPECIAL FOREIGN CURRENCY.	3.5	3.5	3.50	3.50	3.5	3.5	3.50	3.5	0
GRAND TOTAL, NSF.......	1,033.5	1,160.7	1,044.50	1,047.50	1,103.5	1,047.5	1,070.95	1353.5	-320

1/ Reported out by the Science and Technology Committee on May 13th. No further action scheduled.

2/ Reported out by the Labor and Human Resources Committee on June 3rd. Further action delayed pending resolution of jurisdiction over NSF by the Committee or the Commerce, Science and Transportation Committee.

3/ Reported out by the Commerce, Science and Transportation Committee. Further action delayed pending resolution of the jurisdiction dispute with the Labor and Human Resources Committee.

4/ Passed by the House July 21st.

5/ Passed by the Senate July 30th.

6/ Distribution not specified.

7/ Amounts specified only for BBS and PD&M.

8/ Agreed to by Conference September 10th.

NEWS RELEASE

OFFICE OF ASSISTANT SECRETARY OF DEFENSE (PUBLIC AFFAIRS)
WASHINGTON, D.C. 20301
PLEASE NOTE DATE

IMMEDIATE RELEASE October 28, 1981

NO. 495-81
697-3189 (Copies)
695-0192 (Info.)

SECRETARY OF DEFENSE WEINBERGER ANNOUNCES RECEIPT OF 1,103 PROPOSALS IN FIRST PHASE OF SMALL BUSINESS ADVANCED TECHNOLOGY (DESAT) PROGRAM

Secretary of Defense Caspar W. Weinberger today announced that the Department of Defense has received 1,103 contract proposals in response to the Defense Small Business Advanced Technology (DESAT) Program which was initiated on April 30, 1981.

The program was established to exploit the innovative capabilities of this Nation's small high-technology firms and provide solutions to some of the difficult research and development problems confronting the Department of Defense. The DESAT program provides for research and development funding of selected high-risk innovative projects.

The Department of Defense plans to make approximately 1[illegible]0 to 150 six-month contract awards in December 1981.

A key factor of the program is the streamlined procedure for reducing the small firm's initial investment in proposal writing.

The Defense Small Business Advanced Technology Program is not a substitute for current unsolicited proposal mechanisms. It is designed to augment existing acquisition processes and to better inform Department of Defense research offices of the technological potential of the small business community.

Additional information may be obtained by writing to:

Director for Small Business & Economic Utilization Policy
Office of the Under Secretary of Defense
Research and Engineering (Acquisition Management)
Room 2A340, The Pentagon
Washington, D.C. 20301

FACT SHEET

THE DEFENSE SMALL BUSINESS ADVANCED TECHNOLOGY (DESAT) PROGRAM

The Defense Small Business Advanced Technology (DESAT) Program was initiated on April 30, 1981.

Purpose of the DESAT Program is to exploit the innovative capabilities of this Nation's small high technology firms in providing solutions to some of the difficult research and development problems confronting the Department of Defense (DoD).

The program will be implemented by means of a three-phase sequence of research and development funding of high-risk innovative projects.

Phase I awards of up to $50,000 each are contemplated for preliminary research and development to demonstrate the feasibility of those proposals deemed most likely to yield solutions to R&D problems identified by the Military Departments and the Defense Advanced Research Projects Agency.

DoD plans to make approximately 100 to 150 awards for Phase I in December 1981. Contracts under Phase I will continue for six months.

Based on the results of Phase I efforts, DoD plans to award advanced development contracts ranging from $100,000 to $500,000 each in Phase II for a period of up to two years for the projects judged most promising. Phase III will include follow-on DoD production awards, where appropriate, and/or commercial application of the research and development. Commercial application would be funded with private venture capital.

A key factor of the program is the streamlined procedure for reducing the small firm's initial investment in proposal writing.

The Defense Small Business Advanced Technology Program is not a substitute for current unsolicited proposal mechanisms. It is designed to augment existing acquisition processes and to better inform DoD research offices of the technological potential of the small business community.

The DoD established this program in order to capitalize on the creative potential of small high technology firms. Additional information may be obtained by writing to:

Director for Small Business & Economic Utilization Policy
Office of the Under Secretary of Defense
Research and Engineering (Acquisition Management)
Room 2A340, The Pentagon
Washington, D.C. 20301

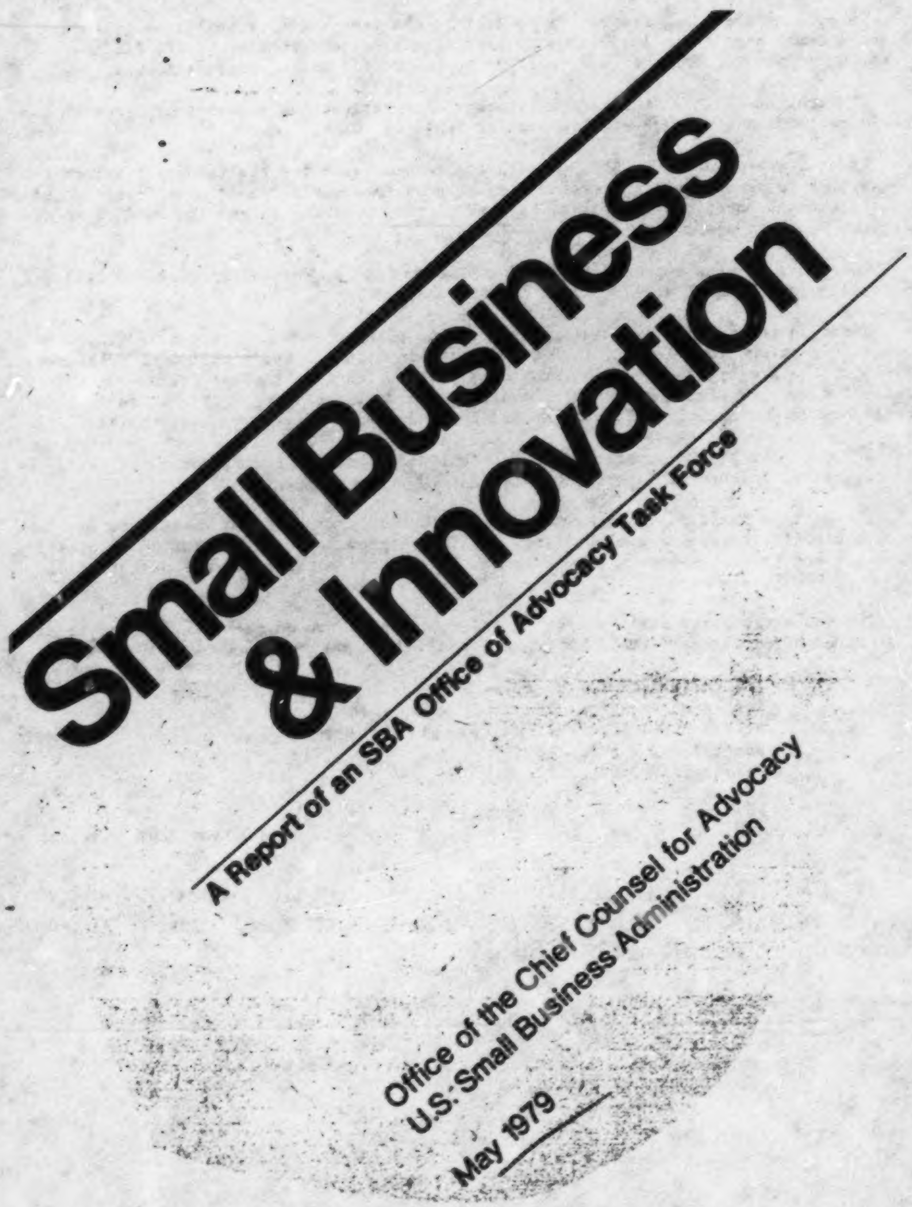
-END-

October 28, 1981

Mr. LAFALCE. With that we will conclude the hearing for today.

[Whereupon, at 4:15 p.m., the subcommittee adjourned, to reconvene subject to call of the Chair.]

APPENDIX



Small Business & Innovation

A Report of an SBA Office of Advocacy Task Force

Office of the Chief Counsel for Advocacy
U.S. Small Business Administration

May 1979

SMALL BUSINESS
AND
INNOVATION

". . . there is a lot that can be done to channel research and development funds to the small business entities of America. We've done an analysis that shows the Government gets a much better return on its investment with a small business with eagerness and growth as a major commitment, a tiny bureaucracy where the superb leadership is very close to the actual working conditions, than we do with an equal amount of research and development money put into very large corporations which might consider research and development projects as one of the tiny portions of its total commitment."

-President Jimmy Carter

"Anything that won't sell, I don't want to invent. Its sale is proof of utility, and utility is success."

-Thomas Alva Edison

Prepared by:

Office of the Chief Counsel
for Advocacy
U.S. Small Business Administration

FOREWORD

P.L. 94-305 charges the Chief Counsel for Advocacy with the responsibilities to: examine the role of small business in the American economy and the contribution which small business can make in . . . stimulating innovation (Section 202(1)); develop proposals for changes in policies and activities of any agency of the Federal Government which will better fulfill the purposes of the Small Business Act and communicate such proposals to the appropriate Federal agencies (Sec. 203(3)); and, recommend specific measures for creating an environment in which all businesses will have an opportunity to compete effectively and expand to their full potential, and to ascertain the common reasons, if any, for small business successes and failures (Sec. 202(9)).

The Chief Counsel is authorized to hold hearings with the approval of the SBA Administrator. From time to time, he may prepare and publish such reports as he deems appropriate to carry out the functions of his office.

Pursuant to this authority, and with the approval of the Administrator, Honorable A. Vernon Weaver, hearings were held on January 4th and 5th and February 22nd and 23rd of this year in Washington, D.C., on the subject of Innovation and Small Business. This report and the draft copy of the "Small Business Innovation Act" are the products of those hearings.

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Appendices

I. "The Effects of Domestic Policies of the Federal Government Upon Innovation By Small Businesses" - A Report of the Small Business Members Who Served on the Industrial Innovation Advisory Committee That Was Established as Part of the Domestic Review. (May, 1979)

II. "Recommendations For Creating Jobs Through the Success of Small, Innovative Businesses" - A Report to the Assistant Secretary of Commerce for Science and Technology by the Commerce Work Group on Job Creation. (December, 1978)

INTRODUCTION

This is a report of an unusual consensus among three citizen study groups on a matter of national urgency. The three groups were named for similar, but slightly different purposes.

First, the Commerce Department named fourteen leading citizens to a "work group" on "Job Creation through the Success of Small, Innovative Businesses." (JC-WG, hereafter).

Second, as part of a Domestic Policy Review of industrial innovation the Commerce Department included six small business people on advisory subgroups. They filed joint views on small business in industrial innovation, in effect becoming an additional subgroup of the Review. (INN-SBTF, hereafter).

And finally, we named twenty executives of small science-based firms and seven venture capital managers to serve as a "task force" on how to strengthen innovative small businesses themselves.

What is remarkable is that these forty-seven citizen leaders whose backgrounds, skills and outlooks are richly diverse arrived at roughly the same set of conclusions. Whether their purpose was creating jobs, shoring-up our sagging industrial innovation rate or expanding small science-based business--where they dealt with the same Federal policies, they reflect substantial consensus.

"Consensus" here does not mean that the views of the three groups are identical or that they cover exactly the same ground. Nor does consensus mean that any individual member of any of the groups would necessarily put his own views in precisely the terms used in the group's report. Every member of each group does not necessarily subscribe to every recommendation, although, of course, by his signature each member concurs generally in the group's consensus.

All three groups seem generally to agree that:

1. The critical need is for an entrepreneurial environment far more favorable to innovation and risk-taking than we have had for the past ten years;

2. Primary reliance for innovation can and should be placed on the private sector;

3. The unsatisfactory environment for innovation and risk-taking results from the cumulative impact of a number of Federal policies;

4. Small business is the most underutilized participant in the Nation's innovation process;

5. There is a compelling national stake in closing the gap between small business' potential contribution to innovation and its present utilization;

6. General Federal policy changes, important as they are, will not help small business enough: the changes needed must be specifically targeted to it;

7. Two typical yet central deficiencies cited among many are: (a) inadequate Federal targeting of Federal R&D procurement to small business; and (b) inadequate incentive for converting Federal R&D results to market sector civil technology innovation.

8. To meet those deficiencies a gradual build up to a 10% set-aside for small business research and development procurement is recommended. That would almost triple small business' share in a few years. Transfer to the private sector would be further stimulated by using 1% to follow a model program developed by the National Science Foundation.

9. Those Federal policy changes necessary for creating a favorable environment are practicable and achievable in the near term.

The SBA Advocacy Task Force met for four days. It was the judgment of the group that documentation and argumentation in support of its viewpoint was generally available. (It had before it the Report of the Commerce Work Group on Job Creation (Appendix II) and knew that the second report (Appendix I) was in preparation.) It therefore concluded that it could best spend its time concentrating on the content of a specific legislative proposal.

What follows then is the text of proposed legislation. It is cast in layman's language and is not in the Congressionally approved form. Its purpose is to reflect recommendations rather than actual statutory language. (Versions of two parts of it have already been introduced in the U.S. Senate: S. 3496 pending before the Senate Judiciary Committee and S. 1074 before the Senate Small Business Committee.) It is followed by a schematic comparison of the recommendations of all three groups. The full texts of the reports of the Commerce Work Group of Job Creation and the Commerce Innovation Small Business Task Force are attached as appendices.

To students of the innovation process many of the recommendations will have a familiar ring. They have figured in other citizen group studies extending from the Charpie Commerce Department report almost twelve years ago, to the SBA Casey report of two years ago.

These forty-seven men and women have given generously of their time and talents. They have done so in the hope that they can communicate to their country's leaders the sense of urgency which they feel about this subject. It is rare that a single general prescription--enhancing the environment for small business technology innovation--appears to contribute to so many high priority Federal goals: stabilizing inflation through new products and new processes; speeding the replacement of non-renewable energy and material resources; strengthening domestic producers' competitive ability and the balance of payments; enlarging the most job productive part of our economy; and enhancing our ability to control undesirable consequences of our industry.

If these forty-seven citizens are right--and we believe they are--our country will gain much or lose much, depending on how quickly it accepts the advice they have given it.

Milton D. Stewart
Chief Counsel for Advocacy
May 23, 1979

A Report of the SBA Advocacy Task Force:

"Small Business Innovation Act of 1979"

A Legislative Proposal

SECTION 1. PURPOSE: TO ESTABLISH a Federal program to bolster innovative small businesses by strengthening their role in Federally funded research and development and by fostering their formation and growth in the economy.

This Act may be cited as the "Small Business Innovation Act of 1979."

SECTION 2: FINDINGS: THE CONGRESS hereby finds that

1. Technological innovation is a most important contributor to job creation, increased productivity, competition and economic growth in the United States as well as a valuable counterforce to inflation and our balance of payments deficit;

2. Small business is a principal source of major innovations in the Nation when compared with large business, universities and government laboratories;

3. Yet the vast majority of Federally funded research and development is conducted in large business, in universities and in government laboratories with small business receiving less than four percent of these funds;

4. While private U.S. technology expenditures are highly concentrated with just six industries accounting for over 85 percent of all industrial research and development spending and just 31 companies, many of them multi-national, accounting for 60 percent of total U.S. R&D;

5. Moreover, the Internal Revenue Code, in its present form insufficiently supports the formation, growth and long-term independent operation of innovative small businesses; THEREFORE

6. It is in the national interest to strengthen the ability of small businesses to be innovative, to increase private sector commercialization of innovations derived from Federal research and development, to increase the proportion of Federal research and development expenditures which go to small firms, to assure small firms of the opportunity to compete for Federal research and development contracts and to stimulate technological innovation by all possible means.

SECTION 3: RESEARCH AND DEVELOPMENT PROCUREMENT SET-ASIDES FOR SMALL BUSINESS: EACH FEDERAL Department or Agency shall target an increase by set-aside for small business of prime research and development contracts of at least one percent (1%) per year of its total research and development budget, beginning in fiscal year 1980, from fiscal year 1979 levels, until small business is receiving a prime contract dollar volume equal to at least ten percent (10%) of that Department's or Agency's total research and development budget.

SECTION 4: SMALL BUSINESS INNOVATION RESEARCH PROGRAMS: EACH DEPARTMENT or Agency with a research and development budget of $100 million or more will initiate a small business innovation research competitive solicitation program modeled after the National Science Foundation's Small Business Innovation research program, but introducing their own topics, making their own solicitation, evaluations and awards, the latter from their own budget. Funding of this program will be at a level equal to at least one percent (1%) of each agency's research and development budget, starting in fiscal year 1980. Each agency program shall be designed to be a direct attempt to stimulate technological innovation in the private sector from Federally funded research and development in agency program objectives.

SECTION 5: PATENTS AND INVENTIONS: (a) SMALL BUSINESSES should be allowed to retain patent rights on inventions made under Federally-supported research according to the following provisions:

1. Each small business shall have a reasonable amount of time to elect to retain title to subject inventions. The Federal agency may retain title if the invention is made under a contract for operation of a government owned research or production facility, or in exceptional circumstances when it is determined that restriction or elimination of the right of the contractor to retain title to a subject invention would better promote the policy and objectives of this bill.

2. Whenever the funding agency determines that it should retain title to a subject invention a copy of this decision shall be sent to the Comptroller General. The Comptroller General will then review this decision and inform the head of the agency of his determination as to whether or not this retention of title is justified. The Comptroller General will also submit an annual report to the House and Senate Committees on the Judiciary on agency implementation of this bill.

3. Each funding agreement shall contain provisions to: (1) insure the right of the Federal Government to receive title to any subject invention not reported to it within a reasonable time; (2) insure the government's right to receive title to inventions when the inventor does not intend to file for patent rights; (3) guarantee that the agency shall have a nonexclusive, nontransferable paid-up license to use the invention; and (4) insure the right of the funding agency to require periodic reports on the utilization or efforts at obtaining utilization of the subject invention.

4. The Federal agency has the right to require the subject inventor of his assignee to grant additional licenses if the agency feels that sufficient steps are not being taken to achieve commercialization. Additional licensing may also be required to alleviate health and safety needs, or under provisions for public use as specified by Federal regulations.

5. If the patent holder receives $250,000 in after-tax profits from licensing any subject invention during a ten-year period, or receives in excess of $2,000,000 on the sale of products embodying or manufactured by a process employing the subject invention within the ten-year period, then the government shall be entitled to collect up to 50 percent (50%) of all net income above these figures until such time as the amount of government research money has been repaid.

6. Any title holder to a subject invention or his assignee shall not grant to any person the exclusive right to use or sell any subject invention in the United States unless that person agrees that any products embodying the subject invention or produced through its use shall be manufactured substantially within the U.S. unless this provision is waived by the funding agency.

7. Federal agencies are authorized to grant exclusive, partially exclusive, or non-exclusive licenses on government owned patents to achieve commercialization.

8. After public notification of the government patents available for licensing the agency will then require that potential licensees submit plans outlining how the invention will be developed and marketed. If the agency determines that the granting of an exclusive or partially exclusive license will not lessen competition it will give first preference in its licensing to qualified small businesses.

9. All contractors not covered under this proposal will continue to operate under the existing agency programs.

(b) The Patent Office shall develop a practical, effective and low-cost per use computer-based search and retrieval system for its own use and public access with particular concern for its usefulness to small business firms. The system shall include appropriate classifications for and require the submission of supplemental information to make accessing easier, more complete and to provide more information concerning a patent's use and potential application.

(c) The Patent Office and the Small Business Administration shall jointly and urgently conduct a study of the feasibility of devising a modified version of the patent law and regulations for use by small businesses, and individual inventors. The goal of such a modified version shall be to reduce the time and cost of securing and defending the patent rights of small businesses and individual inventors to reduce the present inequity resulting from the greater ability of large business to make effective use of the patent laws and regulations.

(d) The Patent Office shall conduct a study regarding the feasibility of initiating a compulsory licensing requirement for patents which are not being adequately exploited and shall report back its findings to the Congress within one year.

SECTION 6: REGULATIONS, POLICIES AND PROCEDURES. (a) Procurement: The Office of Federal Procurement Policy in cooperation with the Small Business Administration shall develop and issue a simplified set of regulations for research and development awards to small business designed from the users' point of view.

1. Cost-sharing requirements for research and development awards to small business shall be eliminated and negotiated fees shall be allowed on all such contracts;

2. No Federal agency or organizational unit within an agency shall exclude small business from a fair and equitable opportunity to compete on a merit basis on the same terms as other participants;

3. Every Federal agency shall seek unsolicited proposals from small business and shall give such proposals a fair and prompt review based upon their

merit, and small business should have equal opportunity to receive sole source awards;

4. Independent research and development (IR&D) and bid and proposal (B&P) costs of small business firms shall be considered as expenses for the fiscal year in which they occur instead of being averaged-back over the past two years;

5. The Departments of Defense and Energy and the National Aeronautics and Space Administration shall take additional steps to conduct regular break-out reviews of all proposed large scale systems contracts for research and development, and to seek means of making more of this effort available to small business.

6. All Federal agencies involved with research and development funding will develop, with the Small Business Administration, specific programs to inform their staffs and consultants of the need to provide a fair and equal opportunity to small women-owned and minority business firms to be considered for Federally funded research and development; and of the requirement to guide, counsel and assist small firms to strengthen their capability to compete and insure that they receive a fair share of all Federal research and development contracts as described in the Small Business Act. Evaluations of procurement personnel performance shall include appraisals of achievement and attitude in expanding small and minority business participation;

7. All Federal agencies have a responsibility to identify and study those problems of their procurement system that, in effect, discriminate against small business and a responsibility to make changes or eliminate these practices to the extent possible through administrative action.

(b) Regulatory Flexibility:

1. All Federal agencies which issue regulations affecting small business shall, insofar as practicable, issue them so as to relate regulatory burdens to the relative size of the firms regulated.

2. In cases where government regulations provide for an agency to make a decision involving a matter initiated by a small business within a certain time period and that decision is not forthcoming by said deadline, it shall be assumed with legal force that the decision is affirmative, i.e., that permission, if not denied within a specified period, is granted an extension, if not denied within a specified period, is approved.

3. Offerings of less than $2 million involving one hundred or less investors shall be exempt from SEC registration requirements.

SECTION 7: CAPITAL FORMATION AND INVESTMENT: (a) In recognition of the risks of small-scale research and development, the potential economic benefit of research and development and the potential importance of small science and technology based firms to the Nation, for any small business which maintains an average investment over three-years of three percent or, in a single year spends six percent of gross revenue in research and development as defined by GAAP over the relevant period:

1. Investors in such firms may defer paying the tax on gains on equity investments provided they are reinvested in another small business (which maintains the same three or six percent R&D investment rate within two years);

2. Gains from capital investment in such firms, if held for a minimum of five years, shall be taxed at half of whatever rate would be applied by the IRS without this provision.

3. Losses from investment in such firms may be carried forward for ten years instead of five years due to the length of time often required for research and development to result in profitable new products, processes or services;

4. The period of exercising stock options in such firms is extended from a maximum of five to a maximum of ten years;

5. Start-up losses from such firms which would otherwise be barred may flow through to individual funding investors for tax purposes under Section 1244 of the Internal Revenue Code.

6. The Qualified Stock Option Plan for key employees is restored for these firms.

• 7. The Department of Labor and the Internal Revenue Service should devise regulations jointly that encourage, stimulate and otherwise provide incentive for, and eliminate obstacles to, increasing significantly the amount of pension fund assets that are invested in small businesses so as to maximize their capacity to be innovative. The Internal Revenue Service also should establish regulations and reporting procedures that improve the ability of small businesses to retain money and thus enables them to cope better with cash flow pressures.

(b) For tax purposes, specialized equipment and instrumentation for research, development or testing may be written off at any time and specialized research, development or testing facilities may be depreciated over a minimum of five years by such small business firms;

(c) Small business concerns may establish and maintain a "Reserve for Research and Development" for tax purposes in profitable years to use in periods of business stress up to the level of ten percent of gross revenues of $1 million, to the extent that contributions to the reserve are equalled by at least that amount of expenditure in that year for research and development.

1. Contributions to the "Research and Development Reserve" shall be considered as income when removed from the reserve unless used for research and development purposes.

2. When a firm ceases to be a small business, it may utilize any existing reserve for the same purpose but may not replenish it;

3. If a small business is acquired by a large firm, any existing reserve shall be considered taxable income.

(d) Subchapter S companies should be allowed to include up to 100 investors and corporations should be allowed to be stockholders of Subchapter S companies.

SECTION 8: IMPROVING SMALL BUSINESS EXPORT PERFORMANCE: THE CREATION of Small Business Export Trade Corporations should be encouraged by a double deduction for these corporations of up to $100,000 of annual expenses associated with the exporting activities of each client, with a loss carryforward of ten years. In addition, small businesses should be allowed a double deduction of special expenses of serving export markets up to $100,000 annually. Also, export procedures for technical products should be simplified.

SECTION 9: GOVERNMENT COMPETITION WITH AND DUPLICATION OF SMALL BUSINESS ENTREPRENEURIAL ACTIVITY: FEDERAL AGENCIES should be prohibited from engaging in and supporting research and development projects that are competitive with or duplicatory of private sector technological developments, or in other ways might prevent the establishment by small business of exclusive technological or intellectual properties in a new area of non-defense technological advancement.

SECTION 10: DEFINITIONS: As used in this Act -

(a) The Term "Federal agency" means an "executive agency" as defined in 5USC and in the military departments as defined by 5 USC 102.

(b) The term "contract" means any contract, grant, or cooperative agreement entered into between any Federal agency or any organization of person for the performance of experiments, developmental or research work funded in whole or in part by the Federal government. Such term includes any assignment, substitution of parties, or subcontract of any type entered into for the performance of experimental, developmental, or research work under the contract.

(c) The term "invention" means any invention or discovery and includes any art, method, process, machine, manufacture, design or composition of matter, or any new and useful improvement thereof, or any variety of plant, which is or may be patentable or otherwise protectable under the laws of the United States.

(d) The term "small business" firm means a concern as defined by Section 2 of Public Law 85-536 (15USC 632) and implementing regulations of the Administrator of the Small Business Administration.

(e) The term "research and development" when considered for tax purposes, means any activity defined as "research and development" according to Generally Accepted Accounting Principles.

(f) The term "research and development" when considered for Federal budget purposes, i.e., "research and development expenditures", means any activity defined as "research and development" according to the National Science Foundation.

COMPARISON TABLE

SBA ADVOCACY
TASK FORCE BILL

COMMERCE JOB CREATION
WORK GROUP (JC-WG)

COMMERCE INNOVATION
SMALL BUSINESS TASK FORCE (INN-SBTF)

TAX RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
Section 7(a)(2)	We recommend that the capital gains tax rate be reduced to 25 percent (the pre-1969 rate) on the capital gains realized from the sales of stock of small businesses (less than 500 employees at date of purchase) whenever such stocks have been held for more than three years, with a rate of 10 percent for the capital gains of investors in the smallest businesses (less than 100 employees at date of purchase). The reduced rates would not apply to capital gains realized from the sale of real estate. (JC-WG) Reduce the federal tax on gains from capital investments in small science and technology firms to a level of fifty percent of the otherwise applicable capital gains rate, if the investment is held for a minimum of five years. (INN-SBTF)
Section 7(a)(2)	We recommend deferral of capital gains taxes on the sales of stock if the proceeds are reinvested within one year in small businesses, except those whose principal activities are real estate transactions. (JC-WG) Allow investors in small science and technology based firms to defer paying capital gains taxes on equity investments, provided the gains are reinvested in other small science and technology based firms within two years. (INN-SBTF)
Section 7(a)(3)	We recommend that the threshold for application of the full corporate tax rate of 46% be raised for small businesses from $100,000 to $200,000 of annual net income; and for annual net income below $200,000 a progressive rate schedule beginning at 10% on the first $50,000, and increasing in 10% increments to $200,000 on each additional $50,000. In addition we recommend that the carry-forward provisions for start-up losses of small businesses be extended from five to ten years. (JC-WG)

TAX RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
Section 7(a)(3) (cont'd)	Allow small science and technology firms to carry forward losses for a period of ten years instead of five years. (INN-SBTF)
Section 7(a)(6)	We recommend restoration of the Qualified Stock Option Plan for Key Employees of small businesses. (JC-WG) Restore the Qualified Stock Option Plan for Key Employees in small science and technology firms, and establish the period for exercising stock options at ten years. (INN-SBTF)
Section 8	We recommend that the creation of Small Business Export Trade Corporations be encouraged by a double deduction for these corporations of up to $100,000 of annual expenses associated with the exporting activities of each client, with a loss carry-forward of ten years. In addition, we recommend that small businesses be allowed a double deduction of special expenses of serving export markets up to $100,000 annually. (JC-WG) Permit small businesses to take double deductions of expenses directly related to export market development. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	We recommend that small businesses be allowed to deduct twice their payments for regulatory advisory services related to compliance with federal, state, and local regulation. (JC-WG)
No parallel section in Advocacy Task	Provide for a twenty-five percent tax credit for research and development related expenditures by small businesses (as currently allowed in Canada). (INN-SBTF)

TAX RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
No parallel section in Advocacy Task Force Bill	Revise the corporate income tax rate to provide greater retention of earnings during the initial start-up and growth phases for small science and technology firms. (INN-SBTF)
Section 7(d), Section 7(a)(5), and Section 7(b)	A new class of equity security be created for start-up innovative businesses that would couple the benefits of limited partnerships with the benefits of Sub-chapter "S" Corporations. This new equity class would possess the following features: -- limited liability protection, -- include up to one hundred investors, -- allow incorporated investors, -- allow the use of cash basis accounting for tax determinations, -- allow operating losses and investment tax credits to flow through to individual funding investors in the year occurred, -- allow specialized equipment and instrumentation for research, development or testing to be expensed in the year purchased. This new class of stock and its benefits should be available to small businesses that spend in excess of five percent of their gross sales revenues and development as determined by Generally Accepted Accounting Principals.(GAAP) (INN-SBTF) (Note: As referred to hereinafter INN-SBTF Recommendation 1)

TAX RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
No parallel section in Advocacy Task Force Bill	Treat license royalties as capital gains instead of ordinary income. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	Eliminate the existing tax liabilities for overseas joint ventures in which the small business investment consists of a contribution of know how and technical information. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	We recommend that private sector individual or corporate owners of technology be rewarded, through appropriate changes in the tax code, for selling, leasing, or licensing their technology to small business firms in the United States. In addition, we recommend the establishment of a voluntary national policy to encourage companies to make their technologies available for uses by others. (JC-WG)
COLUMN NOTE: These two sections of Task Force Bill have no direct paralles in JC-WG or INN-SBTF Reports.	For tax purposes, specialized equipment and instrumentation for research, development or testing may be written off at any time and specialized research, development or testing facilities may be depreciated over a minimum of five years by such small business firms. (ADVOCACY TASK FORCE BILL - Section 7b) The period of exercising stock options in small business science and technology based firms is extended from a maximum of five to a maximum of ten years. (ADVOCACY TASK FORCE BILL - Section 7(a)(5))

RESEARCH AND DEVELOPMENT RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
Section 3	We recommend that each federal agency receiving R&D funds by appropriation from the Congress be required to allocate at least 10 percent of all such funds (excluding those for basic research) to small businesses and that this objective be achieved in annual one percent increments beginning in FY 1980. (JC-WG) Each federal agency should be directed to allocate at least ten percent of its R&D budgets to small business and increase current levels by one percent of its budget each year until the ten percent minimum is established, starting in 1980. (INN-SBTF) This increase should be heavily directed towards basic research at universities and applied research and development in the private sector, with strong incentives for commercialization. (INN-SBTF)
Section 7(c)	We recommend that small business firms be allowed to establish and maintain a reserve for R&D for use in times of financial stress. (JC-WG) Allow small business concerns to establish and retain a "reserve for research and development in profitable years to be used in periods of business stress, with the maximum level of this reserve being ten percent of gross revenues. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	We recommend that each federal agency allocate five percent of its R&D funds for technology transfer. These funds should be used to establish well defined and organized programs of technology transfer in which there are incentives to individual researchers to contribute their time and skills to the identification of commercial applications. Such incentives should be related to the benefits realized from technology transfer. (JC-WG)

RESEARCH AND DEVELOPMENT RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
No parallel section in Advocacy Task Force Bill	The decline in R&D expenditures as a percentage of Gross National Product must be arrested and redirected upwards towards the goal of three precent by 1985. (INN-SBTF)
Section 4	Each year, starting in 1980, each agency with a budget of over $100 million for R&D should allocate at least one percent of its R&D budget to the small business program using the same format as that of the National Science Foundation but with their own research topics, and review and awards procedures. This program should be coordinated by an Inter-Agency Small Business R&D Committee chaired by the Small Business Administration. (INN-SBTF) We recommend that private sector individual or corporate owners of technology be rewarded, through appropriate changes in the tax code, for selling, leasing, or licensing their technology to small business firms in the United States. In addition, we recommend the establishment of a voluntary national policy to encourage companies to make their technologies available for noncompetitive uses by others. . . . . . The Work Group believes the National Science Foundation's program called "Small Business Innovation Applied to National Needs" has great potential for increasing technological innovation in the private sector and is worthy of emulation or even adoption by other federal agencies.. (JC-WG)

RESEARCH AND DEVELOPMENT RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
Section 9	A clear federal policy should be established and enforced to prohibit federal funds from being used to finance projects that are competitive with or duplicatory of private sector technological developments, or in any other ways might prevent the establishment by small business of exclusive technological or intellectual properties in new areas of non-defense technological advancement. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	There should be decreased emphasis on applied research in universities, federal laboratories and non-profit institutions, particularly where such applied work might pre-empt private initiative or is duplicatory or competitive with private sector activities. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	We recommend that private sector individual or corporate owners of technology be rewarded, through appropriate changes in the tax code, for selling, leasing or licensing their technology to small business firms in the United States. In addition, we recommend the establishment of a voluntary national policy to encourage companies to make their technologies available for uses by others. (JC-WG)
No parallel section in Advocacy Task Force Bill	We recommend that there be some redirection of federally-supported agricultural research to the development of technology for improving the efficiency of small family farms and food processors and for making food production, transportation, and preservation less capital and fossil-fuel intensive. (JC-WG)
Section 7(a)(5) Depreciation Allowance	Provide for a twenty-five percent tax credit for research and development related expenditures by small businesses (as currently allowed in Canada). (INN-SBTF)

REGULATORY PROCEDURES

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
No parallel section in Advocacy Task Force Bill	A thorough revision of the regulations and operating procedures of OSHA as they relate to small innovative business to include: -- A general exemption from OSHA, except where the accident history of a particular industry or firm is substantially greater than average, and in such cases, the burden should be upon OSHA to justify action; and -- The prohibition of first instance citations except in extreme cases. (INN-SBTF)
Section 6(b)1	In all regulatory activities, the burden should be placed upon each regulatory agency to establish a cause of concern before requiring regulatory compliance by a small business. Minimum levels of impact should be statutorily defined thereby exempting small businesses in all but extreme and justifiable cases. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	Substantial strengthening of the Regulatory Council to include: -- participation by the Small Business Administration; -- requiring all regulatory agencies to balance the risks of a hazard against the economic costs, with thorough consideration of specific impacts of proposed regulations upon small business creative processes; -- the use of "performance standards" and not "method standards" in those cases where regulatory standards are clearly justified; (JC-WG)

REGULATORY PROCEDURES

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
No parallel section in Advocacy Task Force Bill (cont'd)	-- wherever possible, return to reliance upon standards associations with federally mandated standards being the last resort, and -- improved congressional oversight of the regulatory process as it relates to small innovative businesses. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	Provide product liability and recall insurance at reasonable costs for small businesses, with exemptions from recalls except in the most extreme cases; and the establishment of statutory limits of liability for product failures similar to Workman's Compensation Insurance.(INN-SBTF)
No parallel section in Advocacy Task Force Bill	We recommend that small businesses be allowed to deduct twice their payments for regulatory advisory services related to compliance with federal, state, and local regulation. (INN-SBTF)
COLUMN NOTE: These two sections of Task Force Bill have no direct paralles in JC-WG or INN-SBTF Reports.	All federal agencies which issue regulations affecting small business shall, insofar as practicable, issue them so as to relate regulatory burdens to the relative size of the firms regulated. (ADVOCACY TASK FORCE BILL - Section 6(b)) In cases where government regulations provide for an agency to make a decision involving a matter initiated by a small business within a certain time period and that decision is not forthcoming by said deadline, it shall be assumed with legal force that the decision is affirmative i.e., that permission, if not denied within a specified period, is granted and an extension, if not denied within a specified period, is approved. (ADVOCACY TASK FORCE BILL - Section 6(b)(2))

CAPITAL AND INVESTMENT RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
Section 6(a)7	Modify ERISA to allow up to five percent of pension fund portfolios to be invested in small businesses. (INN-SBTF) We recommend (1) that ERISA's prudent man standard be restated so that it is clearly applicable to the total portfolio of pension fund investments rather than individual investments, and (2) that pension fund managers explicitly be permitted to invest up to five percent of pension fund assets in small firms. (JC-WG)
No parallel section in Advocacy Task Force Bill	Encourage state investment pools to invest a larger percentage of their holdings in small innovative businesses. (INN-SBTF)
Section 6(b)3	Exempt from SEC registration offerings of equity securities for innovative businesses outlined in Recommendation #1 of less than two million dollars. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	Change the charter of the Securities and Exchange Commission to specify the encouragement of the flow of capital into small innovative enterprises as well as to protect the public investor. (INN-SBTF)

PROCUREMENT RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
Section 6 (a) 1	Cost sharing requirements for research and development awards for small business shall be eliminated and negotiated fees shall be allowed on all contracts. (INN - SBTF)
Section 6 (a) (2)	No federal agency shall exclude small business from a fair and equitable opportunity to compete on a merit basis on the same terms as other participants. (INN - SBTF)
Section 6 (a) 4	No agency shall restrict opportunities for small businesses to submit unsolicited proposals and shall give such proposals a fair review based upon their merit. Each agency shall provide small firms opportunities to receive sole source awards. (INN - SBTF)
No parallel section in Advocacy Task Force Bill	A separate set of simplified Federal Acquisition Regulations should be developed to apply to small business firms. (INN - SBTF)
No parallel section in Advocacy Task Force Bill	All proposals submitted by small business must be awarded or declined within four months of submission. (INN - SBTF)
No parallel section in Advocacy Task Force Bill	. Proposal evaluations shall consider total costs relative to the work proposed, and not consider overhead or indirect cost rates due to variations in institutional and company accounting practices. (INN - SBTF)
No parallel section in Advocacy Task Force Bill	Fee negotiations shall take into consideration the level of interest rates and shall be higher in times of high interest rates than in times of low interest rates. All debt service costs shall be allowable costs for small business and procedures should be instituted for prompt payments to small businesses, with late payment penalties. (INN - SBTF)

PROCUREMENT RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
Section 6 (a) 7	Every federal agency should study policies and procedures that discriminate against small businesses, and to institute changes that will equalize opportunity without harming the public interest. (INN - STBF)
COLUMN NOTE: These two sections of Task Force Bill have no direct parallels in JC - WG or INN - SBTF Reports.	The Departments of Defense and Energy and the National Aeronautics and Space Administration shall take additional steps to conduct regular break-out reviews of all proposed large scale systems contracts for research and development. and to seek means of making more of this effort available to small business. (ADVOCACY TASK FORCE BILL - Section 6 (a) (5)) All Federal agencies involved with research and development funding will develop, with the Small Business Administration, specific programs to inform their staffs and consultants of the need to provide a fair and equal opportunity to small women-owned and minority business firms to be considered for Federally funded research and development; and of the requirement to guide, counsel, and assist small firms to strengthen their capability to compete and insure that they receive a fair share of all Federal research and development contracts as described in the Small Business Act. Evaluations of procurement personnel performance shall include appraisals of achievement and attitude in expanding small and minority business participation. (ADVOCACY TASK FORCE BILL Section 6 (a) (6))

PATENT RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
Section 5 (b)	The Patent and Trademark Office should develop a practical and effective computer based search and retrieval system for its own use and public access, with particular concern for its usefulness for small business firms. (INN - SBTF)
Section 5 (c)	A new mandatory re-examination procedure should be instituted in the Patent and Trademark Office whereby a litigant who raises a defense of invalidity of a patent based on new found heretofore unconsidered art should first test the assertion of invalidity in the patent office where the most expert opinions exist at a much reduced costs. (INN - SBTF)
No parallel section in Advocacy Task Force Bill	The budget of the patent office should be increased sufficiently to allow for more thorough searching of prior art using the most modern search technology. (INN - SBTF)
Section 5 (c)	The patent laws should be amended to recognize that the reliability of patents is a keystone in the commitment of funds to carry out commercialization of patented inventions, and incontestibility should be mandated after a period of time so as to result in absolute reliability, except in cases of fraud.(INN - SBTF)
Section 5 (a)(1)(9)	Legislation should be passed to give small businesses title to inventions made under government contracts, with the provision that commercialization be undertaken in a reasonable time. If such commercialization is not undertaken title should revert to the government and the government should license small businesses. As an alternative, small business should be able to obtain title to inventions developed under government awards if they invest an amount of capital at least

PATENT RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
Section 5(a)(1)-(9) (cont'd)	equal to the amount of the R&D award under which the invention occurred. Likewise, with inventions made in national laboratories, the government should preferentially license small business concerns. (INN-SBTF)
Section 5(d)	Small businesses should be able to obtain (with appropriate restrictions) compulsory licenses through suitable proceedings in cases where uncommercialized patents block entry into new markets. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	The Justice Department should be required to undertake competitive impact studies for taking anti-trust action against small business when a small business is attempting to exploit the full property rights afforded by its patent. (INN-SBTF)
No parallel section in Advocacy Task Force Bill	Treat license royalties as capital gains instead of ordinary income. (INN-SBTF)

EXPORT AND TRADE RECOMMENDATIONS

ADVOCACY TASK FORCE BILL SECTION	JC-WG AND/OR INN-SBTF RECOMMENDATIONS
No parallel section in Advocacy Task Force Bill	Eliminate the existing tax liabilities for overseas joint ventures in which the small business investment consists of a contribution of know how and technical information. (INN-SBTF)
Section 8	We recommend that the creation of Small Business Export Trade Corporations be encouraged by a double deduction for these corporations of up to $100,000 of annual expenses associated with the exporting activities of each client, with a loss carry-forward of ten years. In addition, we recommend that small businesses be allowed a double deduction of special expenses of serving export markets up to $100,000 annually. (JC-WG) Permit small businesses to take double deductions of expenses directly related to export market development. (INN-SBTF)

DISSENTING OPINIONS

As noted earlier, the SBA Advocacy Task Force Bill is the product of a nearly unanimous consensus of opinion. However, some individual members of the Task Force did express reservations about various sections of the bill. The following are excerpts from their comments on the bill.

"Section 9 (Government Competition with and Duplication of Small Business Entrepreneurial Activity) is rather broad. Conceivably, a venture could be privately funded on the west coast, and unbeknownst to either the government or west coast venture, there might be an east coast university project being funded by the government with the aim of solving the same problem. Furthermore, the relative success for either project might be uncertain, and the two efforts may be using different technological approaches. In this instance, I would not be in favor of automatically forcing termination of the government sponsored research."

"I do feel strongly that the tax provisions are too complicated and in some cases conflicting. . . . I would prefer to see us go for something fairly simple such as (1) restoration of the stock option, and (2) relief in the area of graduated corporate taxes for the benefit of small businesses."

"It is my feeling that far too much emphasis has been placed on technical aspects of patent reform and special small business concessions. In my view, this area is a quagmire which could swallow the rest of the legislation, while adoption of these provisions is (at best) of secondary importance."

"Section 5(a)(5) seems to me to be unwieldy, virtually impossible to administer, and an accounting nightmare. I suggest that a substitute proposition might be for GSA to make a one time determination after (X) years if repayment of original funding should be required. A concept basically similar to a contract subject to renegotiation."

"In Section 7(a)(1) (deferment of equity investments) I would like to attach some limitations to the roll-over provisions. First, I think it should apply only to individuals, not corporations. Second, I think there should be ceilings, i.e., the roll-over amount for any single investment should be limited to $100,000 or three times the amount of the original investment, whichever figure is greater. Beyond that, ordinary capital gains rates can apply."

"Section 5(a)8 - strike if possible."

"I am troubled by the glaring de-emphasis that (capital formation) has received. Access to capital-specifically, a proper mix of debt and equity capital that is consistent with a given firm's cash-flow generating capability - is the single most critical factor concerning the formation and development of technology based, small businesses. . . . I believe that the "bill" devoted too much attention to the patents issue without considering the fact that patents will remain as patents and not products unless technical entrepreneurs and small companies have sufficient access to start-up and expansion capital."

"Just a pro forma comment on the definition of 'small business'. I feel that it should be limited to companies with 100 employees or less."

"You may recall that (I) questioned the validity and objected to the priority given by our Advisory Committee to the reduction of the capital gains tax as a means for stimulating innovation."

In Section 5(a)(5) "with respect to $2 million of gross revenues and products employing patented items, some recognitions should be made of the value of the patented items in relation to the whole. For instance, the invention may be a $20 value, which is part of a $300,000 jet aircraft engine, and the $2 million test should certainly relate more closely to the quantity of $20 parts sold than to the quantity of aircraft engines incorporating the part sold."

"Also, I repeat my reservations about the elitism implicit in the use of the term 'innovative small businesses.' All small businesses should be deemed to have innovative potential - i.e., ability to improve productivity and create more jobs."

"Government should respect proprietary information submitted as part of proposals for contracts and unless information can be shown to be in the public domain, shall not divulge or use such information except for the evaluation of the submitted proposal. Under no circumstances shall this information be used as the basis of another RFP."

"Government shall not take proprietary ideas 'in house' after initial funding unless the contractors performance shall be deemed poor."

"In Section 7(d) - cannot agree that companies should be allowed to include up to 100 investors. Too many."

BIOGRAPHIES

MEMBERS OF
SBA ADVOCACY TASK FORCE

Milton Bevington:

B.S. in Chemical Engineering, M.I.T., MBA - Harvard Business School. President and CEO of Servidyne, Inc.; former Executive Vice President of The Trane Co.

SERVIDYNE:

Founded in Atlanta in 1966. Supplies total energy management services to industrial, commercial, and institutional services. Clients are nationwide and in over 20 foreign countries. Headquartered in Atlanta, the company has 13 offices located throughout the country.

N. Paul Bosted:

M.S. in Physics, Sr. Fellow - Mellon Institute, Pittsburgh, Pa. Nine years - International Rectifier Corp., as President. Five years as an International Technical Consultant. Joined Sun Systems in 1976. Serves as President Expert in the field of electronics.

SUN SYSTEMS:

Founded in 1971, specializes in sophisticated digital electronic instruments for government installations, NASA and several Nuclear Energy plants. Clients include GE, International Harvester, Westinghouse. Presently have 12 employees. Size of business - $500,000 gross.

William Chandler:

Oregon State University, American Graduate School of International Management. Founder and President of Bay Venture Management, San Francisco, Calif. Formerly associated with Federal Reserve Bank, Raytheon, Veriflo Corp., and Western Growth Fund.

BAY VENTURE MANAGEMENT:

Organized in late 1975 as a venture development firm dealing with start-up companies in the bay area.

Dan Cronin:

B.A. Harvard, Economics, Cum Laude, 1950, Advanced Management Course, Harvard. Vice President, Small Business Association of New England. Formerly salesman, manager and then President of small hospital supply co., which merged in 1968 with a large company with 150 employees and 5 million in business. In 1974 served as Assistant to the then Secretary of Commerce, Elliot Richardson, 1977 joined Ampersand Associates, a venture capital firm. Also served on SBA Regional Advisory Council.

AMPERSAND ASSOCIATES:

Venture Capital firm with investments ranging from 1-1/2 million to 100 million. One client is #2 in the electronic cash register business.

Alfred C. W. Daniels:

E.E. Graduate of Arizona State University, Harvard Law School, also served as an Assistant Dean at Harvard. Vice President, New England, HH Aerospace Design Co., Inc. An officer and rated airline transport pilot, he has served in both command and staff R&D positions in the U.S. Air Force where he also earned four Air Medals with 200 missions in Viet Nam. Received the 1,000 Hour Sabreliner Flight Award. President, Black Corporation Presidents of New England, Inc., and a member of the Board of Directors, Smaller Business Association of New England, Inc.

HH AEROSPACE DESIGN CO., INC.:

A consulting firm established in 1974, incorporated in the State of New York. A 100% minority-owned corporation, serving the Eastern Seaboard. HHA's capabilities include R&D studies, economic analysis, design and engineering services in aerospace, electronics and transportation planning, including surface systems, tests and evaluation.

Dr. Orrie Friedman:

Ph.D. Chemistry - McGill University, 1944. Former Professor of Chemistry - Brandeis University. Left to organize Collaborative Research, Inc., in 1962. Has served as President & Science Director since its inception. His contributions to bio-medical research are included in over 90 science publications. Well known for basic discoveries in cancer chemotherapy. Served on a number of Advisory Ctes at NIH. Member, Office and Director of several corporate, philanthropist and professional organizations.

COLLABORATIVE RESEARCH, INC.:

A high technology company with interests primarily in bio-medics and research and development. Organized in 1962 to undertake sponsored research, the company consists of two closely integrated operating divisions: Research and Pharmacutical Products, and a central Research Division. Company has expertise in a number of areas as the cutting edge of new cell and molecular biological technology.

Edward Gaffney:

Michigan Technology University, Mechanical Engineering. Developed and patented the cushion lift chair. Awarded U.S. Small Business Person of the Year in 1978, and Small Business Man of Wisconsin in 1977. President and Founder of Ortho-Kinetics. Currently Vice President of Independent Business Association of Wisconsin. Member of Wisconsin Legislative Council, Subcommittee on Small Business.

ORTHO-KINETICS:

Founded in 1963, small high technology based firm, specializing in research and development and manufacture of the cushion lift seat and childrens care seats. Currently employs 50 people.

Clyde R. Goodheart:

B.S. in Biology, Northwestern University, MD - Northwestern Medical School, MS - Northwestern Graduate School. Three years at California Institute of Technology in Post-Doctoral Fellowship. Assistant Professor and Associate Professor, Department of Pediatrics, University of Southern California Medical School, Children's Hospital of Los Angeles. Well known for his work in cancer research, Dr. Goodheart has been involved in bio-medical studies and has written many scientific articles.

BIO LABS, INC.:

Founded in July, 1970 by Dr. Clyde R. Goodheart, it serves government and industry through contract research, product development programs, quality control testing, industrial microbiology. Current research areas include tissue culture work, immunology, biochemical and biophysical work with viruses.

Sidney Green:

B.S. University of Missouri in Mechanical Engineering, M.S. University of Pittsburgh, attended University of Pennsylvania Graduate School & received the degree of Engineer in Engineering Mechanics from Stanford University Formerly with Westinghouse Electric Company Research Labs, General Motors Defense Research Labs, & GM Technical Center. President & Chief Executive Officer of Terra Tek, he is active on many government committees & professional societies. Published over 40 open literature papers and reports, holds several patents.

TERRA TEK:

Founded in 1970 as a for-profit company, a springoff venture pursuing application of ideas primarily initiated at the University of Utah. Recognized as a leader in problem-solving applications involving rock mechanics, the geosciences and associated technology, and for its practical application of material sciences. Main lines of business include R&D, manufacture of sophisticated servocontrolled computer interfaced test systems, full-scale testing of drilling, mining and exploitation of new ventures.

Harold Guller:

Washington University School of Engineering. President and Chairman of the Board of Essex Cryogenics Industries, Inc., and President of its wholly owned subsidiaries: Essex Cryogenics of Missouri, Inc., Higgs Screw Products, Propellex Corp., and Essex Precision Controls, Inc. Serves as Chairman of the St. Louis District Advisory Council of the Small Business Administration. Member of various local and regional advisory and technical committees and several civic organizations.

ESSEX CRYOGENICS INDUSTRIES, INC.

Designs and produces hydraulic, pneumatic fuel, electronic and electromechanical components and subsystems for aircraft applications. Selected as the Small Business Prime Contractor of 1971 for Region VII, Small Business Subcontractor of 1972 for Region VII; Small Business Subcontractor of 1973 for Region VII and National Small Business Subcontractor of the Year 1973.

Dr. Eugene Haddad:

B.S. Engineering Physics, Alabama Polytechnic Institute of Technology, M.S. in Physics, University of California, Ph.D., University of Utah. Formerly staff member of Los Alamos Scientific Laboratory and AEC Research Division. 1966-1967 Visiting Professor of Physics, Catholic University. 1968-1969 Assistant to Deputy Director of Science and Technology, U.S. Defense Atomic Support Agency. 1969-1975 Executive Vice President, Columbia Scientific Industries Corp., Austin, Texas. Since 1976, President, Chief Executive Officer and Director of Columbia Scientific Industries Corp. Member of several professional and honorary societies. Has published numerous papers in scientific journals.

COLUMBIA SCIENTIFIC CORPORATION:

The main thrust of the company is in the design and manufacture of high quality environmental and safety equipment. The company also conducts research for federal, state and local governments, as well as the private sector. Located in Austin, Texas, the company employs 85 people and has an annual sales volume of approximately $4.5 million.

Roger Hill:

B.S. Physics, Brown University, M.S. Elec. Engr., Northwestern University, Doctorate studies at Northwestern University. Small Business person of the Year in State of Wisconsin, 1978. Member of Independent Business Association of Wisconsin, Special Committee on Small Business of Wisconsin Legislative Council, First National Bank Board of Directors, International Trade Subcommittee of the Chamber of Commerce of the U.S., Institute of Elec. & Electronic Engrs.

GETTYS MANUFACTURING CO.:

Founded in 1959 by Roger Gettys Hill, as a three-person engineering and consulting firm and later dynamically expanded into an international, multi-million dollar enterprise with subsidiaries in England, Germany and Italy. Today, Gettys and its licensee supply over 50% of the world DC servo drive market. In 1965 introduced world's first all-electronic three-dimensional tracer.

Robert Hillas:

B.A. Dartmouth, MBA - Stanford University. Seven years as a Venture Capital Investment Specialist with E.M. Warburg, Pincus and Company. Serves on two Boards of Directors and one Advisory Committee of Investee Companies.

E. M. WARBURG, PINCUS, & CO.:

Specialists in financial services. One of the larger private venture capital pools in the country. Deal with start-up money particularly in large publicly held companies.

Patrick Iannotta

Majored in Economics, Queens College, Member, Treasury Advisory Council; New York State Governors High Technology Task Force; President of Ecolotrol for past ten years.

ECOLOTROL, INC.:

Founded in 1969, developed a standardized treatment system for industrial waste water and municipal sewage. Number of plants in design & construction throughout the world. Currently commercializing sophisticated instruments and control devices in the energy area. Ecolotrol holds several patents.

Charles G. James:

B.S. in Business Administration - Bowling Green State University. Treasurer and member of Board of Directors, The Sea Pines Company, Hilton Head, South Carolina. Staff person, Laurance S. Rockefeller, New York. Group Vice President of Heizer Corporation, Chicago, Illinois, a venture capital firm, currently with Battelle Memorial Institute, Columbus, Ohio, as President of Scientific Advances, Inc., a wholly-owned subsidiary of Batelle.

SCIENTIFIC ADVANCES INC.:

Provides financial, management, and technical support for companies or projects originating within or without Battelle; a whollyowned subsidiary of Battelle Memorial Institute, Columbus, Ohio. SAI was conceived as a source for short run production, marketing and eventual disposition of unique Battelle developed products, SAI has shifted to the formation and growth of new ventures to introduce innovative technology.

Paul Kelley:

Harvard, MBA, Northeastern University. Is a doctoral candidate at Boston University. Is responsible for implementing the Massachusetts Technology Development Corporation Revolving Loan Fund program. Has been personally involved in several turn-around situations and technology-based start-ups. He was instrumental in putting together the financial packages for over 40 successful start-up, technology-based companies. President of SUN Community Development Corp. and is the Senior Lecturer in the Venture Development Program at Boston State College.

MASSACHUSETTS TECHNOLOGY DEVELOPMENT CORPORATION:

A public-purpose development finance mechanism established by an act of the Massachusetts State Legislature in July 1978. Has the dual capability to provide management and direct financial assistance to early-stage, technology-based small businesses in Massachusetts. The MTDC can provide seed capital to commercialize new technologies which will foster primary job creation and increase tax revenues and exports.

Gilbert V. Levin:

B.E., The Johns Hopkins University, 1947, M.S.,1948, Ph.D., 1963, Environmental Engineering. President and Founder, Chairman of the Board of Directors, Biospherics Inc., Rockville, Md. Formerly Director, Life Systems Division. Member, Board of Directors, Hazelton Labs, Inc., Falls Church, Va. Holds more than 33 patents in biological treatment of wastewater and in microbiology. Member of several honorary science associations & author of approximately 100 technical publications.

BIOSPHERICS INCORPORATED:

Organized into three major operating divisions: The Environmental Instrumentation Division which develops, manufactures, and markets sophisticated innovative instruments in the fields of pollution control and health; the Laboratory Division which performs contract research and development on environmental and health problems, develops Biospherics proprietary products in these areas and offers commercial analytical services in chemistry, biochemistry, microbiology, pesticides, and toxic substances; the Science Writing Division which writes, edits, produces and disseminates information in these areas of interest.

Harold K. Lonsdale:

B.S. Chemistry, Rutgers University, 1953. Ph.D in Physical Chemistry, Pennsylvania State University, 1957. Formerly, Nuclear Research Officer, U.S. Air Force, staff member, Research and Development Laboratory, General Atomic Co., Principal Scientist, ALZA Corp., and Visiting scientist, Max Planck Institute of Biophysics, Frankfurt, West Germany, and the Weizmann Institute of Science, Rehovot, Israel. Since 1974, President of Bend Research Inc., Bend, Oregon. Member of the American Chemical Society, Editorial Board of Desalination Journal and Editor of the Journal of Membrance Science. Adjunct Professor, Oregon State University. Author of many publications.

BEND RESEARCH, INC:

Is a young firm engaged in contract research and development for industry and government. Their field of expertise is membrance science and technology.

David T. Morgenthaler:

Massachusetts Institute of Technology, B.S., M.S. (mechanical engineering), Licensed Professional Engineer. Presently, Senior Partner, Morgenthaler Associates since 1969. Formerly with Foseco, Inc., as President and Vice President of Delavan Manufacturing Co. Chairman, National Venture Capital Association. Holds directorships with numerous companies throughout the country and member of several civic and regional organizations.

MORGENTHALER ASSOCIATES:

A private venture capital firm founded in 1968 by David Morgenthaler. The company's objective is to obtain substantial long term gains by investing in companies which offer some kind of proprietary product or service. It invests throughout North America and is interested in all types of business. The firm's normal investment size ranges from $100,000 to $300,000 in a given investment.

George W. Murphy:

B.S., Fordham, 1960. From 1958 to 1970 employed by IBM in various marketing and management positions. Since 1970 President and Chief Executive Officer of Educational Computer Corporation.

EDUCATIONAL COMPUTER CORPORATION:

Is the industry leader in research, development, and production of low cost computer controlled simulation devices that are used in advanced training programs. ECC blends computer technology with modern task oriented instructional methods to produce fully integrated technical training programs.

Dr. Arthur S. Obeymayer:

B.A. with High Honors, Swarthmore College, 1952. Ph.D. in Chemistry, M.I.T., 1956. Recipient of NST fellowships. President and founder of Moleculon Research Corporation. Founder and first Chairman of the Research Management Association. Currently, Vice President of the American Association of Small Research Companies. Has served in various capacities in the Association of Technical Professionals, Boston Industrial Mission, Federation of American Scientists and the Small Business Association of New England. Is frequently called upon by the Federal and Massachusetts state governments to serve in an advisory capacity.

MOLECULON RESEARCH CORPORATION:

Specializes in research, development and consulting in chemistry and allied fields. These services range from feasibility studies and product development to problem solving, chemical engineering investigations, and process development. Moleculon makes Poroplastic R film and powder. Product applications include controlled release materials, dermatological preparations, membrane separations for hydro-metallurgy and impurity removal from waste water, and color change monitoring of toxic vapors.

Dr. Judith H. Obeymeyer:

B.S., mathematics, Carnegie - Mellon University, 1956. Ph.D. in Mathematics, Harvard University, 1963. Assistant Professor, 1960-1966 Wellesley College. In 1978 taught mathematics at the University of Massachusetts. Recipient of four NSF Fellowships. Since 1968 Trustee and Manager of Technology Really Trust. Has served in a number of capacities with Moleculon Research Corporation for the last fifteen years. Has served as officer and on the board of numerous civic and charitable organizations and is a member of several honorary and professional societies.

MOLECULON RESERACH CORPORATION:

Specializes in research, development and consulting in chemistry and allied fields. These services range from feasibility studies and product development to problem solving, chemical engineering investigations, and process development. Moleculon makes Poroplastic R film and powder. Product applications include controlled release materials, dermatological preparations, membrane separations for hydro-metallurgy and impurity removal from waste water, and color change monitoring of toxic vapors.

Tom Perkins:

Degree in Electrical Engineering, Massachusetts Institute of Technology, M.B.A., Harvard Graduate School of Business Administration. Venture Capitalist with Kleiner, Perkins, Caufield, & Byers, San Francisco. Director, National Venture Capital Association, past President, Western Association of Venture Capitalists. Co-founder of Optics Technology and founded University Laboratories which became the leading producer of inexpensive gas lasers.

KLEINER, PERKINS, CAUFIELD & BYERS:

An active venture capital partnership with a capitalization of $15 million. Investments typically range from a minimum of $200,000 to a maximum of $1 million. They seek opportunities with the potential to achieve significant shares of high growth markets. Examples: computers & computer peripherals, office equipment, medical products and instruments, microbiology, genetic engineering, telecommunications, semiconductors, laser & optics, and pollution control.

Harry D. Richardson:

SCMP - Harvard University, 1976; MS - Engineering, University of Alabama, 1950; BS - Mechanical-Electrical Engineering, Louisiana Polytechnic Institute, 1941. Chairman and President of Nuclear Systems, Inc. since 1971. Currently consulting Professor to Louisiana State University. Member of the Board of Directors of several companies and member of numerous professional societies.

NUCLEAR SYSTEMS, INC.:

Is a small technology company. Primarily it is engaged in (1) developing, manufacturing, and marketing equipment using radioisotopes, (2) environmental and quality control testing electronic components, and (3) developing, manufacturing, and marketing products for management and conservation of energy in homes and small commerical buildings. In 1979, the sales volume is estimated to exceed $6 million. There are 250 employees located in six U.S. locations and one manufacturing plant in Mexico. NSI is a public company with nearly 500 stockholders.

Walter D. Syniuta:

Sc.D - M.I.T., Mechanical Engineering, M.Sc, Queens University, B.Sc, Queens University. President, Advanced Mechanical Technology, Inc. Formerly with Scientific Energy Systems Corp., Assistant & Associate Professor of Mechanical Engineering, M.I.T., Engineering Consultant, Development Engineer & Vibration Engineer. Member of various professional societies & author of several publications relating to his expertise in the field of electron microscopy.

ADVANCED MECHANICAL TECHNOLOGY, INC.:

A Massachusetts corporation engaged in R & D, and manufacturing of instrumentation. Engaged in R&D in the field of energy conversion systems, with current development programs in gas-fired hot water heaters, gas-fired residential space heating, waste-heat recovery systems, a novel heat-actuated heat-pump based on the Stirling cycle, use of ceramics in heat engines, and heat engine combustion research. AMTI is currently engaged in several commercial engineering projects .

Bruno O. Weinschel:

Dr. Engineering degree from the Technische Hochschule, Munich, Germany. Since 1952, President of the Weinschel Engineering Co., Inc. He is known for his work in the state of the art of insertion-loss microwave measurement. Serves as Director of the Precision Measurements Association. A Fellow in the Institution of Electrical Engineers. Editorial review boards of The Microwave Journal and Microwave Systems News. Author or co-author of forty journal articles and inventor or co-inventor of twenty patents.

WEINSCHEL ENGINEERING COMPANY, INC.:

A leader in the design and manufacture of high quality instruments and components for use throughout the microwave industry. Known worldwide for their precision and quality. Contributor to the advancement of microwave technology. Complete in-house, totally integrated engineering, machining and assembly, with inspection and test procedures in Gaithersburg, Md.

Robert F. Zicarelli:

B.S. and MBA - Northwestern University. Has been with Northwest Growth Fund, Inc. for 18 years, having joined NWGF as Vice President and Director in 1961. His investments in venture capital experiences span 30 years. A member of the Board of Governors of National Association of Small Business Investment Co.'s. (NASBIC) and Board of Directors, National Venture Capital Association. Past President of Regional SBIC Association and member of SBA National Advisory Council.

NORTHWEST GROWTH FUND:

Founded in 1961, it is an SBIC headquartered in Minneapolis with offices in Denver and Portand. It is a wholly-owned subsidiary of Northwest Ban Corporation. It has assets in excess of $40 million and investments in more than 50 small businesses, employing over 15,000 people. NWGF has invested in a broad range of apparel and personal products, electronics, basic manufacturing, communications, industrial and consumer services. One of the largest SBIC's in the country actively dedicated to venture capital funding.

BIOGRAPHIES

MEMBERS OF COMMERCE INNOVATION SMALL BUSINESS "TASK FORCE"

Mr. Wayne Coloney:

Texas A&M, Summa Cum Laude Graduate - Georgia Institute of Technology, 1950. Serves as Chairman of the Board & Chief Executive Officer of the Wayne H. Coloney Co., Tallahassee, Florida. Formerly associated with Barrett, Daffin & Coloney, and J.E. Greiner & Co., Tampa. A professional engineer certified in Florida, Georgia, Alabama, and North Carolina. Member of American Society of Civil Engineers, National Society of Professional Engineers and numerous other organizations, both professional & philanthropic. Listed in Who's Who in the World and in the South and Southwest. Mr. Coloney holds several patents and has published articles related to his extensive interest in knowledge of land planning, transportation facilities, drainage and air pollution and historical renovation.

WAYNE H. COLONEY COMPANY:

Founded in 1970 as a broad-based engineering firm dealing with structural, mechanical and legal engineering in the areas of land planning, pollution control and design. Grew from three employees in 1970 to presently 200. Awarded in 1972 - Pollution Control Citation, 1975, SBA Regional Prime Contractor of the Year, placed in top 500 design firms chosen by McGraw-Hill magazine.

Eugene M. Lang:

B.A. from Swarthmore College, M.S. from Columbia University, mechanical engineering studies at Brooklyn Polytechnic Institute. Currently, President of REFAC Technology Development Corporation of New York City. Chairman of Scriptomatic, Inc., Philadelphia, Pa., Chairman of J.D.S., Inc., a West Palm Beach, Florida real estate company, Chairman, Electronic Research Associates Inc., Moonachie, New Jersey, a manufacturer of power supplies and loudspeakers. Chairman of REFAC

Electronics Corp., Barkhamsted, Conn., manufacturer of microminiature display devices and switches. Serves on Department of Commerce, Advisory Committee on Science and Innovation.

REFAC TECHNOLOGY DEVELOPMENT CORPORATION:

Since 1952, this company's principal business has been international technology transfer -- the creation of manufacturing licenses and joint ventures as a means for client manufacturers to enter export markets. Most REFAC clients are smaller companies that have specialized industrial products or manufacturing processes.

George Lockwood:

B.S. in Civil Engineering, Northwestern University M.B.A.- Harvard University, Currently President & Founder of Monterey Abalone Farm, Founder of Monterey Kelp Corporation which was acquired by Merck & Co., Inc. Formerly with Global Marine, a pioneer firm in off-shore oil well drilling. Mr. Lockwood holds several patents in his varied background including electronics & electronics manufacturing, oceanography & oceanography engineering, civil engineering, heavy construction & chemical processes.

MONTEREY ABALONE FARM:

Founded in 1972, specializes in domesticating the abalone species of the marine snail in California. In the first part of its history the company did extensive research in biological, environmental & nutritional factors relative to commercialization. Currently undergoing a major expansion of its operations.

Duane D. Pearsall:

B.S. from University of Denver, Commercial Engineering. General Motors Institute. Founder and President of the Small Business Development Corporation. Previously founded and was President of the Pearsall Company (1955-1966) and of Statitrol Corporation (1964-1977). Member of several professional societies. Member of Executive Committee and Board of Directors of Denver Chamber of Commerce and Council of Small Business of the Chamber of Commerce of the U.S., Regional Vice Chairman for Small Business, N.W. Region. Serves on S.B.A. Colorado District Advisory Council and M.F.I.B. Action Council Committee. Has published several technical papers. Colorado Small Business Person of the Year - 1976. National Small Business Person of the Year - 1976. Outstanding Citizen Award Mile High Sertoma Club - 1978. Serves on the Board of Directors of several companies and organizations.

SMALL BUSINESS DEVELOPMENT CORPORATION:

This was formed to support three activities - as consultant to small businesses, as an investor in small business and to organize a stronger voice for small business in Federal legislation.

Eric P. Schellin:

A.B. Columbia University, J.D., George Washington University. Lecturer, Patent, Trademark & Copyright Law, Georgetwon University, 1974-present. Executive Vice President of the National Patent Council, Inc., Chairman of the Board of Trustees of the National Small Business Assoc., 1979. President, Erdo Co., Member of various legal & scientific associations and the bar of V.A., D.C., Supreme Court and Court of Customs and Patent Appeals.

Robert C. Springborn:

B.S. University of Illinois, 1954, Ph.d. Organic chemistry Cornell University, 1954. Since 1972 Chairman and President of Springborn Laboratories, Inc. Formerly, Chairman and President of General Economic Corporation; Vice President, Chemical Group and General Manager of New Ventures Division, W.R. Grace; General Manager, Food and Chemicals Division, Ionics, Inc.; and Vice President, Technical Director, Ohio Rubber Division of Eagle-Picher Industries, Inc. Hold several patents in the field of high polymers. Several papers on entrepreneurship. Member of numerous professional, civic honorary societies. Chairman of the Coalition of Small Technical Businesses.

SPRINGBORN LABORATORIES, INC.:

Is an internationally oriented, employee-owned company. Serving the chemical and allied products industry with special expertise in high polymers offices in the U.S., Europe and Asia.

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APPENDIX I

A Report of Small Business Members Who Served on the Industrial Innovation Advisory Committee That Was Established as Part of the Domestic Policy Review

THE EFFECTS OF DOMESTIC POLICIES OF THE FEDERAL GOVERNMENT UPON INNOVATION BY SMALL BUSINESSES

A Report of Small Business Members
Who Served on the Industrial Innovation Advisory Committee
That Was Established as Part of the Domestic Policy Review.

May 1, 1979

NOTICE: This report represents the views of the several members from small business who served on the Advisory Committee on Industrial Innovation, an advisory committee that was convened by and reported to the Secretary of Commerce. This report of the committee members from small businesses does not necessarily represent the views of the Department of Commerce, the Small Business Administration, or any other agency of the Federal Government.

INTRODUCTION

In mid-1978 President Carter ordered a review of the impact of federal policies upon industrial innovation. The President directed Secretary of Commerce Juanita Krepps to supervise this study, and she appointed an Industrial Advisory Committee to work under the direction of Dr. Jordan Baruch, Assistant Secretary for Science and Technology to advise her on this project. This Industrial Advisory Committee was composed of approximately one hundred and fifty business executives who were divided into seven subcommittees to analyse specific areas of federal policy and their impact upon private decision making relative to innovation.

While most members of the several subcommittees were from large corporations, each group included one executive from small business who participated in the work of the Committee and made contributions to the draft reports that were produced. Because the small business representation was limited in comparison to the much larger representation of large corporations, one would expect that the subcommittee draft reports would not analyse the small business situation in appreciable depth. There is however, almost universal recognition by the seven subcommittees that small businesses make a large contribution to innovation, and that the policies, laws, regulations and procedures of the Federal Government impose a very heavy burden upon small business innovation.

Upon completion of the draft reports of the seven subcommittees, the small business representatives decided that an additional report should be prepared on the specific impact of federal policies upon innovation in small businesses, and how federal policies might be revised to again stimulate innovation in this important sector of the economy. We wish to emphasize that our report is not a minority report expressing disagreements with the subcommittees, but a supplement to address the importance, and the unique role and problems of small innovative enterprises in America. We wish to place emphasis upon certain areas of the draft reports and make additional recommendations of our own.

Without detracting from the strong vigor of our recommendations, it must be noted that there are diverse opinions amongst our Committee members with respect to emphasis, priority, and details of our recommendations.

THE AD-HOC COMMITTEE OF SMALL BUSINESS MEMBERS*

George S. Lockwood, Acting Chairman
President
Monterey Abalone Farms
Monterey, California
(Member--Subcommittee on Environment, Health and Safety Regulations)

Wayne H. Coloney
Chairman and Chief Executive Officer
Wayne H. Coloney Company
Tallahassee, Florida
(Member--Subcommittee on Procurement and Direct Support of Research and Development)

Eugene M. Lang
President
REFAC Technological Development Corporation
New York, New York
(Member--Subcommittee on Economic and Trade Policy)

Duane Pearsall
President
Small Business Development Corporation
Littleton, Colorado
(Member--Subcommittee on Industry Structure and Competition)

Eric Schellin, Esq.
Attorney at Law
Arlington, Virginia
(Member--Subcommittee on Patents and Information)

Dr. Robert C. Springborn
President
Springborn Laboratories
Enfield, Connecticut
(Member--Subcommittee on Procurement and Direct Support of Research and Development)

*The membership listed after each name indicates the Subcommittee of the Industrial Innovation Advisory Committee upon which the individual served.

SUMMARY OF CONCLUSIONS

. Innovation is an essential ingredient for creating jobs, controlling inflation, and for economic and social growth.

. Small businesses make a disproportionately large contribution to innovation. There is something fundamental about this unusual ability of small firms to innovate that must be preserved for the sake of healthy economic and social growth.

. If the U.S. desires to bring inflation under control, to create new and better jobs, and to continue to enjoy the economic and social benefits of innovation, individual entrepreneurs and their small companies must be free to innovate. Unfortunately, the environment for small business innovation has greatly deteriorated during the past decade.

. The creative processes in small businesses are pronouncedly different from large corporations and institutions. There is a lack of awareness within government of how small independent innovators create and how federal policies determine the climate for small business innovation.

. A wide array of federal policies adversely impact upon small innovative businesses, including:

> --Federal tax, pension fund and security policies that have virtually eliminated all forms of capital from small innovative business ventures;
>
> --Government regulations that treat large and small firms equally that are, in fact, discriminatory against small firms;
>
> --Federal funding for research and development where the most innovative sector of the American economy, small science and technology based enterprises, are virtually excluded from effective participation;
>
> --Federal procurement policies that similarly exclude small innovative firms;
>
> --Patent policies that have resulted in the diminution of the value of patent protection for independent inventors and small businesses.

. With sufficient amendments to Domestic Policies to provide relief for small creative enterprises, a major renaissance in anti-inflationary innovation will emerge with concomitant social and economic growth. Such amendments will require a major departure from current policies affecting small businesses in capital acquisition, regulation, R & D funding, procurement and patents.

SUMMARY OF RECOMMENDATIONS

1. Changes in the federal tax code to again encourage the flow of capital into small innovative businesses.

2. Changes in ERISA policies to return a portion of our national flow of savings to high-risk innovation.

3. Changes in security laws and regulations to remove obstacles for innovative enterprises to acquire seed, start-up and expansion capital.

4. Changes in regulatory policies to remove adverse discrimination against the small innovator.

5. Changes in federal R & D funding policies to produce substantially greater results by awarding a larger share to small businesses.

6. Changes in federal procurement policies to allow greater participation by small businesses on a more equitable basis.

7. Strengthening our weakened patent system, and making changes in federal policies to recognize and protect initial exclusivitiy as an essential requirement for successful innovation.

Specific details for these recommendations are included at the end of this report.

THE EFFECTS OF DOMESTIC POLICIES OF THE FEDERAL GOVERNMENT UPON INNOVATION BY SMALL BUSINESSES.

Innovation is an essential ingredient for economic and social growth. It is the driving force that increases productivity and that results in new products, processes and services. Innovations create new and better jobs, reduces production costs and prices, increases foreign sales, and increases real personal income so that our citizens can finance major advancements in the qualities of life such as better education, improved health care, increased longevity, and more leisure and recreation.

Without innovation, economic stagnation occurs resulting in rising prices, decreased employment, and increased foreign competition--all symptoms of stagnation induced inflation. Inflation, our nation's major problem is, in our opinion, a direct result of a large decline in private sector innovation over the past decade.

To a large extent, the madates of the United States electorate to fulfill basic social and human needs of our citizens requires a rapid rate of economic growth. Such social and economic growth can only occur with vigorous private sector innovation.

SMALL BUSINESSES MAKE A DISPROPORTIONATELY LARGE CONTRIBUTION TO INNOVATION.

The economic history of the United States is replete with examples of small innovators making major contributions. From the late 1700's through the 1970's a major source of technological advancement was the result of individual inventors and entrepreneurs working independently of our large industrial corporations, universities, and government laboratories. This is particularly true in situations where radically new concepts have been introduced.

In our early history we had Eli Whitney in 1793 with his cotton gin and Robert Fulton with the steamboat in the 1840's. These two innovations had an enormous impact on young America. Later came the railroads. Next, in telecommunications, we had Morse and Bell, whose contributions greatly accelerated the growth of our economy. Similarly, Edison, Westinghouse, McCormack, the Wright Brothers, Ford and DeForest made introductions that laid the foundation for further economic advancements. This is only a partial list. All of these innovators were small guys.

The same trend continued after World War II with the success stories of Land at Polaroid and Watson at International Business Machines. During the 1960's we saw the emergence of companies such as Xerox, Digital Equipment and Hewlett-Packard, each beginning as individuals with their small companies who were free and able to innovate. In addition to these better known names, there were thousands of small high-technology companies spawned during the 1950's that have created major growth in our economy and have increased the quantity and quality of employment.

A recent study by the National Science Foundation concluded that in the post World War II period, firms with less than one thousand employees were responsible for half of the "most significant new industrial products and processes." Firms with one-hundred or fewer employees produced twenty-four percent of such innovations. In addition, the cost per innovation in a small firm was found to be less than in a large firm since small firms produced twenty-four times more major innovations per research and development dollar expended as did large firms. Yet small firms conduct only three percent of United States research and development. While there is much innovation that can only occur in large resourceful companies, small firms are often more adverturesome and have a greater propensity for risk taking, and accordingly are able to move faster and use resources more efficiently than large companies. We believe that there is something fundamental about the unusual ability of small firms to innovate that must be preserved for the sake of healthy economic and social growth in the United States.

SMALL INNOVATIVE BUSINESSES CREATE JOBS AND TAX REVENUES AT A RAPID RATE.

The role of small innovative businesses in stimulating economic growth can be seen from two recent studies. The first, by the Massachussets Institute of Technology Development Foundation, shows compounded average annual growth from 1969 to 1974 for the following three groups of companies:

	Sales	Jobs
Mature Companies	11.4%	0.6%
Innovative Companies	13.2%	4.3%
Young High-technology Companies	42.5%	40.7%

In this study, Mature Companies were Bethlehem Steel, DuPont, General Electric, General Foods, International Paper and Proctor & Gamble. Innovative Companies were Polaroid, Minnesota Mining and Manufacturing, International Business Machines, Xerox, and Texas Instruments. Young High-technology Companies included Data General, National Semiconductor, Compugraphics, Digital Equipment, and Marion Laboratories. The companies selected in each group were, in every case, leaders in their particular industry.

The M.I.T. report states:

> "It is worth noting that during the five year period, the six mature companies with combined sales of $36 billion in 1974 experienced a net gain of only 25,000 jobs, whereas the five young, high-technology companies with combined sales of only $857 million had a net increase in employment of almost 35,000 jobs. The five innovative companies with combined sales of $21 billion during the same period created 106,000 jobs."

This study also observed that the Innovative Companies produced three times the level of tax revenues as a percentage of sales as did the mature firms.

Conclusions similar to those mentioned above emerged from a study of 269 firms by the American Electronic Association. In February 1978, Dr. Edwin V. Zschau of the A.E.A. presented the results of that study to the Senate Select Committee on Small Business. The report showed the following growth of employment for new established firms as contrasted to more mature companies:

Years Since Founding	Stage of Development	Employment Growth Rates in 1976
20+	Mature	0.5%
10-20	Teenage	17.4%
5-10	Developing	27.4%
15	Start-up	57.7%

Dr. Zschau also reported that annual benefits to the economy realized in 1976 for each $100 of equity captial that had been invested in Start-up companies founded between 1971 and 1975 were:

. foreign sales	$70 per year
. personal income taxes	$15 per year
. federal corporate taxes	$15 per year
. state and local taxes	$5 per year
. total taxes	$35 per year

This data shows that the benefits of investment in small innovative ventures are large (e.g., jobs are created and these jobs are kept at home--exports are created instead of imports--a new $35 per year flow in tax revenues is realised for each $100 initial investment). This large and powerful flow of benefits starts soon after the investment is made, and the benefits are substantially greater than those of large corporations.

The huge benefits derived from a favorable climate for small business innovation is apparent from this review of the contributions to economic growth made by individual entrepreneurs and their small companies. If the U.S. desires to bring inflation under control and to continue to enjoy the economic and social benefits of innovation, individual entrepreneurs and their small companies must be free to engage in innovation.

THE ENVIRONMENT FOR SMALL BUSINESS INNOVATION IS NOT HEALTHY.

It is clear to us that innovation is the keystone of economic and social growth, and that individual entrepreneurs and their small innovative businesses have contributed a disproportionately large share of innovation. It is also clear that the climate for the formation and nurturing of small innovative enterprises in America has suffered a major deterioration over the past ten years and as a result innovation has withered.

There are no concise indices for innovation, although productivity is one measureable result. From the close of World War II until the mid-1960's, the average annual productivity increase for each manufacturing worker was approximately 4.1 percent. From the late 1960's through the mid 1970's, it averaged 1.6 percent per year. In 1978 it was 1.0 percent, and some economists are predicting a rate of 0.4 percent for 1979. This is a ten fold decline that has occurred steadily over the past fifteen years.

Similar trends of a substantial downward nature can be observed in the flow of capital to small firms. In the seven years from 1969 through 1975, the amount of capital acquired by small firms with less than $5 million in net worth from public markets declined from approximately $1,500 million to approximately $15 million--a 100 fold decrease. No significant improvement has occurred in the past three years. However, during this period of catastrophic decline, capital raised by all corporations in the public security markets increased from $28 billion in 1972 to over $41 billion in 1975, or an increase of approximately 50 percent. This 100 fold decline in capital flow to small innovative enterprises is indicative of the decline in small business innovation because risk-capital is an essential ingredient of innovation.

Without precise indices for small business innovation, it is impossible for us to quantify this key factor accurately. It is our observation as experienced entrepreneurs in our respective industries however, that the vigor in small business innovation has substantially declined. We would estimate that this decline amounts to a level of 10 percent (or less) of the average innovation from 1950 to 1970--or at least a ten fold decline. We regret that we cannot be more precise in estimating this important factor, but we believe that this estimate, based upon our personal observations, is realistic.

In our opinion, a renaissance in innovation in America is possible, but a basic systemic change must first occur in governmental policies affecting small innovative businesses. The needs of innovators, their incentives to innovate, and obstacles to their creativity are often substantially different for small firms than for large mature corporations. In most cases government policy-makers and administrators fail to recognize this critical difference between large and small businesses. As a result, major constraints to innovation unintentionally imposed by government must be modified if a rebirth of vigorous innovation is to occur in the United States.

THE DISTINCTIVE CHARACTERISTICS OF THE CREATIVE PROCESS IN SMALL BUSINESS.

Creative processes in small businesses have some pronounced differences from the creative processes in large corporations. In both cases, however, the processes usually have the following steps in common:

. Conception--the use of scientific, market or other knowledge to conceive a new product, process or service to fill a need.

. Reduction to practice--taking this concept from an idea into a practical reality, such as a first-model prototype.

. Start-up--adapting the first-model prototype for production and sales.

. Expansion--with successful early production, expansion of production and sales.

With success, a concept moves laboriously through these stages until the firm and its markets mature. Signficant employment and tax revenues are generated during the later stages of this process.

Until maturity is achieved and expansion levels out, this creative process is usually a struggle for the innovator and his small firm--

--a struggle to obtain adequate capital (usually in several increments);

--a struggle to make the breakthroughs necessary to overcome the never ending unexpected obstacles;

--a struggle to make the first precious sale (or to get the first proposal accepted), to meet an optomistic delivery schedule, and to keep the first customers happy;

--a struggle to keep development costs and initial production costs within available capital;

--a struggle to collect accounts-receivable and other payments in time to meet the next payroll (a particular struggle when selling to the government);

--a struggle to convince the banker that sales, production cost, and cash flow projections are realistic and that customers will pay on schedule;

--a struggle to acquire and motivate a team of capable scientific, engineering, production and management talent.

There is usually a delicate balance between success and failure in this struggle.

The capital required for this creative process is usually acquired from individual outside sources and not from a flow of earnings as is the case of large corporations; a critical difference between large and small firms.

Entrepreneurs often spend 15 hours per day, seven days a week, to meet this challenge. Time and personal energy are the most precious assets in this process. The intensity of this struggle, requiring the strong personal commitment of the innovator, is usually much greater in a small business than in a large corporation. The willingness of the small business innovator to undertake this intense struggle is one significant reason why small businesses make disproportionately large contributions to innovation. The intensity of this struggle and the vigorous committment with which it is executed by the entrepreneur is a unique component of small business innovation.

WHAT INCENTIVES MOTIVATE THE SMALL INNOVATOR TO MEET THIS STRUGGLE?

New concepts are only generated from individuals, and creative indivudals need an environment that is conducive for creation with rewards, recognition, profits, freedoms, and the availability of capital, basic knowledge and other tools with which to create. There appears to us to be a lack of understanding within government of how individuals create in the private sector, and how they implement their creations--particularly small independent innovators.

The stimulation of setting out on one's own, trying his own ideas, working in an environment with few disapproval levels, that permits and encourages new approaches and even radical ideas, and has a "put your entire personal assets on the line" element of risk, coupled with a chance for a reward of above average wealth for his intense labors, are important motivations for the innovator in small businesses that are different from large corporations.

During the historically innovative 1950's and 1960's, and even into the early 1970's, there was a steady stream of individuals who were motivated to leave large corporations, universities and government to form small scientific and technical businesses. This stream is now a dribble. There was, at that time, a favorable climate where the creative individual had freedom to innovate and had access to capital.

Since then many governmental disapproval levels and obstacles have emerged, risks have gone up, rewards have come down--and at the same time the availability of capital for small American enterprises has declined to an all time low. The entrepreneural climate is now dismal and a substantial portion of the community of the technically creative are dispirited. There are mountains to be climbed that are going unclimbed. There is useful scientific knowledge that has been developed in our universities and elsewhere that is not being used to fill social and economic needs. There are products to be developed and manufactured that are still only ideas in inventors heads. There are innovative businesses that should be started that are not being started. This inability for creative individuals to undertake is of great concern to this Committee.

FEDERAL POLICIES DETERMINE THE ENTREPRENEURAL CLIMATE

There is a wide array of federal policies that adversely impact upon small business entrepreneurs that have resulted in the arrest of this heretofore highly innovative sector of our society. The federal policies that determine the entrepreneural climate are in the following areas:

- Capital Availability. Unlike large corporations that fund R & D and other innovative investments from cash flows from mature products, a small business innovator must acquire capital from outside sources. Federal tax, pension fund and security policies have virtually eliminated all forms of seed, start-up, and expansion capital from small innovative business ventures.

- Regulation. Two essential requirements for the creative individual are time and freedom to create. Both time and freedom are being consumed with the ever increasing scope of government regulatory activities that have emerged since 1970. Interferences and delays by government compound the entrepreneur's struggle, sap his creative energy, and increase the risk of failure. Many small firms are unable to understand and comply with government regulatory processes and to effectively participate in law and rule-making that have a life or death impact upon their firms. The present system of applying regulations equally to large and small businesses heavily discriminates against small businesses.

- Federal Funding for R & D. In recent years, federal support for R & D has declined as a percentage of GNP and has become highly concentrated in a few large companies, universities and federal laboratories. While direct support for applied research and development at these institutions has grown, the most innovative sector of the American economy, small science and technology based enterprises, are virtually excluded from effective participation in federally funded applied research.

- Federal Procurement. The largest buyer of goods and services in the world is the U.S. government. The process of selling in this market and meeting government specifications chews the small innovative business to bits. There is little room for innovation within federal supply specifications and procurement procedures. The effect of these procedures is to prevent small business participation and deny the government of potential sources of innovation that would lower procurement costs, and provide new and improved products and services. In the interest of innovation and of good procurement, small innovative firms should be provided greater participation in this important market.

. Patents. The historic keystone to inventiveness and information transfer has been our U.S. patent system. Patent grants have provided the small innovator protection against competition by large resourceful firms, and this protection has often provided incentives for capital acquisition. Unfortunately in recent years the value of patents has weakened considerably due to inadequate Patent and Trademark Office procedures resulting in adverse judicial decisions. In addition, substantial uncertainty has emerged as a result of a wide range of interpretations within the federal judiciary of patent law. At the present time, over fifty percent of patents contested at the circuit court level are invalidated, and the cost of defending such suits is prohibitive for a small firm. A return to a strong patent system is essential for a rebirth in innovation.

THESE SAME FEDERAL POLICIES FORCE CONCENTRATION OF INNOVATION INTO FEWER AND FEWER LARGE FIRMS.

Simultaneous with the decline in the formation of new innovative enterprises there has been a concurrent acquisition of existing small innovative companies by large corporations. The unfortunate trends in the above policy areas is forcing concentration:

. Those federal policies affecting capital acquisition, coupled with the U.S. corporate income tax rate structure, force rapidly expanding small businesses to seek big firms with capital resource in order to obtain expansion capital;

. Estate tax considerations force many small innovative firms to sell their companies to large public firms. The highly restrictive security exchange policies accent this problem.

. In some industries the regulatory burden is beyond the ability of small firms to handle, while in others it is a major deterrent to creativity;

. In federal procurement, small firms (even those with outstanding products) cannot compete with large companies that specialize in this market;

. The weakened patent system forces the small patent holder into litigation with expenses so great that the small business cannot protect its rights against larger infringers, including government.

In order to aquire capital to meet expansion needs; to avoid high estate taxes; to obtain federal regulatory permits; to sell a new product to the government; or to defend it's patents, it is frequently necessary for the small innovative firm to sell out to a larger firm with greater resources. When this occurs, the research and development budgets are often soon cut and the innovative entrepreneurs leave the firm. A creative independent organization is changed into a static dependent one.

* * *

SOME GENERAL CONCLUSIONS

1. Technological innovation is essential to control inflation. And, it is essential if we are to fill our pressing social and human needs.

2. Independent entrepreneurs and their small businesses have made a disproportionately large contribution to anti-inflationary innovation. Unfortunately, small business creativity is blocked by a wide array of federal policies.

3. A renaissance in innovation is possible. The removal of unintended government inhibitors would allow small businesses to innovate again.

4. A fundamental reason for the decline in innovation is the failure of federal policy-makers and administrators to recognize the contributions from small firms to technological innovation, and their failure to recognize that small innovative firms cannot accomodate the burdens of government as readily as large companies. The burden of government upon small innovators is disproportionately large and often overwhelming. Government policies and regulations that treat large and small firms equally are, in fact, discriminatory against small firms.

5. When government recognizes the destructive nature of this disproportionate and overwhelming burden upon the small innovator, and when sufficient amendments to domestic policies are accomplished to allow relief, a major renaissance in anti-inflationary innovation will emerge in America with concomitant social and economic growth. For this to occur, a major departure is necessary from current federal policies affecting small businesses in capital acquisition, regulation, R & D funding, procurement, and patents.

Specific recommendations follow for each of these policy areas.

* * *

CAPITAL AVAILABILITY AND RETENTION

An essential ingredient for innovation is capital, and the lack of seed, start-up and expansion capital is probably the major factor throttling innovation by small businesses. Unfortunately, significant changes have occurred in tax laws, security exchange regulations, and federally mandated pension fund management policies during the past decade that have drastically reduced the flow of capital into new innovative businesses.

THE CAPITAL ALLOCATION PROCESS FOR SMALL BUSINESS INNOVATION IS SIGNIFICANTLY DIFFERENT THAN FOR BIG CORPORATIONS.

Innovation in large corporations is largely financed from the flow of earnings from mature products, and in many cases, sophisticated rate-of-return analyses are used to allocate this cash flow into promising areas of research, product development, and facility expansion. In addition, the profitable corporation receives an immediate income-tax benefit of approximately fifty percent for research and innovation related expenses, and a ten percent tax credit for related capital expenditures.

In contrast, the small independent innovator without a cash flow from one or more mature products must usually acquire his capital from external sources, often in several increments. No tax credits are available to the independent innovator until his new product becomes profitable. The net effect is that the small guy must raise from outside sources more than twice the amount of capital for the same innovation as a large corporation.

The disparity between the small business and the large corporation is further increased since debt capital is unavailable to the small firm to finance innovation, at least not until first profitability for the new product occurs. While debt is an important source of capital for large corporations, it is less available to small firms.

Furthermore, during the capital intensive stage of early and rapid expansion where initial profitability occurs, the high corporate income tax rate structure prevents the small firm from accumulating sufficient retained earnings to finance the internal expansion of its new product. In order to expand and protect its new market successes, the small enterprise must often turn to outside sources for capital. In contrast, the large corporation with mature business lines is usually able to supply all stages of capital from earnings of existing products.

In acquiring capital for each stage of innovation--seed, start-up and expansion--the federal tax code adversely and substantially discriminates against the small creative business.

FEDERAL SECURITY POLICIES ALSO DISCRIMINATE AGAINST INNOVATION.

The rules of the Security Exchange Commission that are established to prevent investment fraud, act to exclude from capital markets small innovative enterprises that do not have a proven flow of earnings from mature products. The registration and reporting requirements of the SEC are prohibitively costly to the small enterprise. In essence, the SEC is doing its job of preventing fraud by preventing all types of small businesses--both good and bad--from access to public markets.

Large corporations can afford access to public capital markets but small innovative firms are virtually excluded.

FEDERAL TAX LAWS DISCOURAGE INDIVIDUAL INVESTORS FROM MAKING INNOVATIVE INVESTMENTS.

Individual investors in the towns and cities across America in the past have played an important role in providing seed, start-up and expansion capital for innovation. In many (if not most) cases of significant innovation individual investors have been the only source of seed capital for the independent innovator to move from concepts into practical realities.

Unfortunately, changes in tax policies over the past ten years now favor areas for investment for individual investors other than innovation. Retirement funding, real estate, oil and gas drilling, and agriculture receive favorable tax treatment while innovation does not. We do not believe that real estate speculation and cattle feed lots are as important to healthy economic growth as is technological innovation--yet real estate and cattle feeding are favored and innovation is not. Innovation cannot compete for capital with these activities that are favored in the tax code.

Of additional concern to us are federal policies that encourage retirement funding. In 1970, legislation was passed to encourage retirement savings by providing tax-sheltered Individual Retirement Account (IRA) and Keogh plans so that the savings of doctors, lawyers, businessmen, and others with high income would be channeled into professionally managed institutional investment pools. In 1973, pension fund management policy legislation (ERISA) was passed requiring that such pools be managed by a "prudent man rule" that essentially precludes the use of this savings flow for small innovative businesses. Where prior to 1970 a substantial supply of savings throughout America was available for local enterprising inventors and entrepreneurs, this flow of savings is now diverted into tax sheltered centralized institutional investment pools that are precluded by law from investing in local promising ventures.

This combination of IRA-Keogh-ERISA acts like a huge vacuum sweeper moving around the country extracting innovative capital and placing it into large centralized funds where it is invested in the securities of governments, in large corporations, and into real estate. Hundreds of billions of dollars have been removed from local discretionary investments and locked up. In our opinion, this tax code induced removal of local discretionary investment decision making has caused a major disaster for innovation. This shift in investment decision making has been particularly disastrous for high-risk seed capital needs where ideas are first reduced to realities by using funds provided by friends, relatives, and personal acquaintances of the inventor on the local scene.

SPECIAL CONSIDERATIONS FOR SMALL INNOVATIVE BUSINESSES ARE NECESSARY.

It is our opinion that large amounts of risk-capital will again flow into small innovative businesses if federal tax laws are changed to put small business innovation at a parity with large corporations--and at a parity with other investment alternatives for independent individual investors. Without such parity discrimination is occurring where small businesses cannot compete for capital for innovation.

Special considerations are necessary for our highly innovative sector of the economy and an amended tax code, changes in SEC policies, and revised ERISA rules are essential for the stimulation of a badly needed renaissance in anti-inflation innovation. It is the opinion of the members of this Committee that the following recommendations should be undertaken:

RECOMMENDATION # 1--CHANGES IN THE FEDERAL TAX CODE.

. A new class of equity security be created for start-up innovative businesses that would couple the benefits of limited partnerships with the benefits of Sub-chapter "S" Corporations. This new equity class would possess the following features;

--limited liability protection,

--include up to one hundred investors,

--allow corporated investors,

--allow the use of cash basis accounting for tax determinations,

--allow operating losses and investment tax credits to flow through to individual funding investors in the year occurred,

--allow specialized equipment and instrumentation for research, development or testing to be expensed in the year purchased;

This new class of stock and its benefits should be availabe to small businesses that spend in excess of five percent of their gross sales revenues in research and development as determined by Generally Accepted Accounting Principals (GAAP).

. Allow investors in small science and technology based firms to defer paying capital gains taxes on equity investments, provided the gains are reinvested in other small science and technology based firms within two years;

. Reduce the federal tax on gains from capital investments in small science and technology firms to a level of fifty percent of the otherwise applicable capital gains rate, if the investment is held for a minimum of five years;

. Allow small science and technology firms to carry forward losses for a period of ten years instead of five years;

. Restore the Qualified Stock Option Plan for key employees in small science and technology firms, and establish the period for exercising stock options at ten years;

. Provide for a twenty-five percent tax credit for research and development related expenditures by small businesses (as currently allowed in Canada);

. Revise the corporate income tax rate to provide greater retention of earnings during the initial start-up and growth phases for small science and technology firms;

. Allow small business concerns to establish and retain a "reserve for research and development" in profitable years to be used in periods of business stress, with the maximum level of this reserve being ten percent of gross revenues;

. Treat license royalites as capital gains instead of ordinary income;

. Eliminate the existing tax liabilities for overseas joint ventures in which the small business investment consists of a contribution of know how and technical information;

. Permit small businesses to take double deductions of expenses directly related to export market development;

RECOMMENDATION # 2--CHANGES IN INVESTMENT MANAGEMENT POLICIES.

. Modify ERISA to allow up to five percent of pension fund portfolios to be invested in small businesses;

. Encourage state investment pools to invest a larger percentage of their holdings in small innovative businesses.

RECOMMENDATION # 3--CHANGES IN SECURITY EXCHANGE LAWS AND REGULATIONS.

. Exempt from SEC registration offerings of equity securities for innovative businesses outlined in Recommendation # 1 of less than two million dollars;

. Change the charter of the Security Exchange Commission to specify the encouragement of the flow of capital into small innovative enterprises as well as to protect the public investor.

The objective of these first three recommendations is to remove unintended obstacles that have arisen and to provide incentives for the allocation of seed, start-up, and expansion capital to promising innovative ventures, by:

. Providing tax parity for small innovative firms equal to that of large corporations;

. Providing tax parity for investments in innovation equal to that provided for alternate investment opportunities for independent investors;

. Allowing greater retention of retained earnings for early expansion;

. Removing SEC discrimination;

. Releasing locked-up capital in retirement funds.

We believe that the loss in tax revenues from these recommendations will be miniscule when compared to increased tax revenues to be received within several years of enacting these changes. The tax umbrella that would be provided for stimulating small business innovation would not be applicable to the large earning flows for large mature corporations nor would they be available for non-innovative individual investments. While we appreciate that our recommendations might result in some compromises in investor protection against fraud and losses, and that there may be some problems of definition and of administrative convenience, we believe that these costs will be minor compared to the overall societal benefits resulting from the rebirth in anti-inflation innovation that would follow.

* * *

REGULATION.

During the past decade, a new regulatory environment has emerged to fulfill a wide variety of social "mandates". This environment includes new agencies such as OSHA, EPA, CPSC, NTSB and EEOC, in addition to expanded jurisdictions of existing agencies such as FDA, SEC, FTC, DOE, DOT, Justice, Corps of Engineers and others involved in the regulation of business in one way or another. We believe that the mission of each of these agencies is well intended and, if only one (or a few) of them were impacting upon small innovative businesses, their impact could be absorbed within the creative process. Unfortunately, for many small businesses there is mandatory involvement with a wide range of agencies and, in some cases, the laws and regulations being enforced were intended for large sources of hazards, or for some other purpose than to control the new field being pioneered by the innovator.

In some new fields, the regulatory environment is so intense and so diverse that the whole of this impact is greater than the sum of the parts. The small guy is overwhelmed by the law-making, rule-making, and enforcement processes of regulation. This intense diverse regulatory environment is contributing to inflation in two ways--by impeding innovation (particularly innovation in small enterprises)--and by adding significantly to business costs.

REGULATION IS A MAJOR DETERRENT ON THE CREATIVE PROCESS.

The overwhelming nature of widespread regulation results in an adverse interference with the innovative process, pushing the balance away from success. The innovator's most precious assets of time and energy are drained. Expensive delays are experienced, and the creative entrepreneur and his scientists and engineers are kept on the defensive--not on the offensive that is necessary for their success.

In addition to regulations contributing to inflation, a serious consequence of this new regulatory environment is that economic progress is distorted in favor of those fields where government involvement is minimal and where innovation can occur relatively untrammled. In those fields where regulation is diverse and intense, greatly reduced entrepreneural activities are experience, and only those innovators who can map and navigate the governmental process can succeed.

The costs of regulation to the innovative process in small business are large and real.

GOVERNMENT FAILS TO RECOGNIZE THE DISPROPORTIONATELY HEAVY IMPACT OF THE REGULATORY PROCESS UPON SMALL BUSINESS INNOVATION.

When approaching government, the small businessman often encounters a presumption of harm and dishonesty, or at best, indifference, and not a sympathetic understanding of the peculiar needs and problems of the small guy attempting to be creative. The legislative and rule-making processes are impossible forums for his participation and his bureaucratic adversaries have substantially greater influence and credibility in these processes. Laws, rules, policies and procedures often are made for "administrative convenience", and such administrative conveniences usually become an inconvenience for the innovator. As a society we must address the question of whose convenience is more important--the bureaucrat's or the innovator's?

During the 1970's, "due process of law" in American democracy has become an unfamiliar phenomenom to the small innovator--the process is closed to him--and grossly discrminates against him. This adversary regulatory process in America today has caused the remaining few small innovators to consider government as an alien power committed to their destruction.

The small innovative business cannot deal with this intense and diverse regulatory environemnt as readily as can the large corporation. If a re-birth of innovation is to occur, government must recognize this adverse discrimination and a major departure from current regulatory processes that affect small innovative businesses is necessary.

In view of this deleterious impact of federal regulation upon small business enterprises, and the serious consequences of inflation and stymied innovation, we wish to make the following recommendations:

RECOMMENDATION # 4--CHANGES IN REGULATORY POLICIES.

. A thorough revision of the regulations and operating procedures of OSHA as they relate to small innovative business to include:

--A general exemption from OSHA, except where the accident history of a particular industry or firm is substantially greater than average, and in such cases, the burden should be upon OSHA to justify action; and

--The prohibition of first instance citations except in extreme cases.

. In all regulatory activities, the burden should be placed upon each regulatory agency to establish a cause of concern before requiring regulatory compliance by a small business. Minimum levels of impact should be statutorily defined thereby exempting small businesses in all but extreme and justifiable cases.

. Substantial strengthening of the Regulatory Council to include:

--participation by the Small Business Administration;

--requiring all regulatory agencies to balance the risks of a hazard against the economic costs, with thorough consideration of specific impacts of proposed regulations upon small business creative processes;

--the use of "performance standards" and not "method standards" in those cases where regulatory standards are clearly justified;

--wherever possible, return to reliance upon standards associations with federally mandated standards being the last resort;

--improved congressional oversight of the regulatory process as it relates to small innovative businesses.

. Provide product liability and recall insurance at reasonable costs for small businesses, with exemptions from recalls except in the most extreme cases; and the establishment of statutory limits of liability for product failures similar to Workman's Compensation Insurance.

The OSHA problem is particularly serious for small innovative enterprises that have to deal with this agency, and a revision in OSHA policies and practices is necessary. Some members of our Committee believe that it would be in the best interest of workplace safety as well as of industrial innovation to eliminate OSHA entirely. Others agree, but believe that this may be politically impractical. Still others are of the opinion that government can improve workplace safety with the significant amendments to present policies and procedures that we are proposing.

The recently published report Making Prevention Pay by the Inner-Agency Taskforce on Workplace Safety and Health concludes that OSHA has failed to make an improvement in workplace safety during the past decade. And, it is clear to us that the burden of this program on small innovative businesses is discriminatory and highly adverse. In addition, OSHA is an agency that has generated an enormous amount of litigation, and in cases of appealed OSHA citations, over fifty percent have been vacated. Yet, litigation is not a form of relief for small innovative businesses--the OSHA rule-making and appeals process, and judiciary relief, is a costly and time consuming game that small enterprises cannot play. Therefore, the burdens of citations should not be placed upon small businesses, at least in the first instance, and we urge that the burden be placed upon government to demonstrate on a case by case basis that unusually great hazards exist before OSHA can exercise jurisdiction in the case of small businesses.

In most other areas of regulation, it is our opinion that the burden of compliance for small business enterprises should be substantially reduced, and in many cases can be eliminated without materially compromising the overall objectives of the subject regulation. It is virtually impossible for the struggling innovator to comply with the never ending forms, mandated reports, applications, investigations, inspections, permits, licenses, standards, variances, checklists, guidelines, plans, study-sessions, pubic meetings, rule-makings, non-rule makings, hearings, non-hearings, burdens of proof, appeals, etc., and to accomodate the rapidly growing enforcement budgets at all levels of government to "make businesses comply." The language of government is a strange tongue written by lawyers for judges that is as incomprehensible to the small innovator as is the regulatory process itself. This government problem is more than simply a paperwork blitz--it is a major consumer of time, energy, and capital, and is sometimes absolutely prohibitive.

We believe that it is essential that a clearly specified level of impact or hazard exposure be established before a business is regulated, to allow the entrepreneur to innovate without the burden of regulation consuming his precious time, drive and capital, and in causing inordinate delays for him to learn the appropriate rules, accomplish their compliance, and obtain appropriate permits. The burden is particularly onerous upon the innovating entrepreneur attempting to do something new since most existing laws are intended to eliminate some other form of evil.

The new regulatory environment is another example of how government polices unfairly discriminate against small innovative firms by treating them the same as big corpoations. Some big corporations can survive in this regulatory game--they can enter law making and rule making procedures, retain experts to ply the most subtle interpretations of the rules, and can afford the time and costs of appeals and litigations, etc.,--the small guys simply cannot because "the due process" is too time consuming, costly, and technically overbearing. If the small guy tries, the balance in his struggle for survival weighs heavily towards failure. Therefore, we strongly believe that reasonable exemptions are necessary for small firms if our sector of the economy is to be revitalized as a major source of non-inflationary innovation.

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DIRECT FUNDING OF R & D BY THE FEDERAL GOVERNMENT.

Economists consistently state that technological innovation is the principle contributor to U.S. economic power and is necessary in order to continue to advance our standard of living. And research and development is one of the critical ingredients of innovation. Economists also state that the social return on R & D is high with some estimating it to be twice the private return. For these reasons, together with the anti-inflationary impact of innovation, we believe that it is important to increase our national investment in R & D.

FEDERAL SUPPORT FOR R & D HAS DECLINED AND HAS BECOME CONCENTRATED.

While we believe it is important to increase our national investment in R & D, this investment, as a percentage of Gross National Product (GNP), has been declining since 1968, while that of some countries (Japan in particular) has continued to rise. One-half of our R & D investment is privately financed and one-half is from federal sources; with one-half the federal R & D being for defense. While industrial R & D expenditures have held their own as a percentage of GNP during the last twenty years, government R & D has not kept up with the growth in GNP. In the federal area, small business receives only three and one-half percent of federal R & D expenditures.

Of additional concern to us is that four agencies--defense, space, energy, and HEW--fund eighty-eight percent of federal R & D. Similarly, there is a concentration of U.S. industrial R & D into a few industries and into a few companies. According to Science Indicators, 1976, six industries account for eight-five percent of total U.S. industrial R & D. Ten companies do thirty-six percent, and thirty-one do over sixty-percent. Greater than eighty percent of industry's R & D is carried out by only two hundred firms.

We believe that this concentration of private R & D into a few large firms is not in our national interest. While there is such a great concentration of private R & D, it is small business that has accounted for one-half of our total major innovations over the past twenty years and it did so while conducting only three percent of the total U.S. R & D. This is a powerful testimony for the contributions and effectiveness of small innovative businesses. Science Indicators also reports that during the twenty year period from 1953 to 1973, small businesses contributed twenty-four times the number of major innovations per dollar of R & D as did large firms. In addition, the total cost for maintaining a scientist or engineer in R & D for a small business has averaged one-half of that for large firms. It is further reported that inventors in universities contributed far less frequently.

In view of these facts, we must ask why so much of our federal R & D is awarded to large firms, federal laboratories and universities, and so little to small business since technological innovation is critical to our social-economic progress. We believe that a larger share of federally funded R & D awarded to small businesses would produce substantially greater results.

REVISED INCENTIVES WILL STIMULATE PRIVATE INNOVATION.

One of the critical obstacles to more productive R & D funding is the lack of recognition within government that innovation usually does not result from research findings without proper incentives to put these findings to work. The objective pursued by most federal R & D recepients is to meet the precise specifications required by the government and not to pursue innovative ideas and commercialization of results. This requirement to pursue narrow objectives prevents innovation. In universities the incentive is to uncover new knowlege and to publish these findings in scientific journals--not to produce innovations for commercialization in the private sector.

Sometimes federally funded applied R & D in universities and government laboratories is aimed at preventing a private firm from gaining a technological lead, or in duplicating private technological successes with the objective of public disclosure. Such competition with the private sector, particularly with small firms, is a substantial disincentive to the innovator and to his sources of capital.

We believe that greater private sector utilization of scientific knowledge generated by federally funded research is desireable, and commend the Small Business Innovation Program of the National Science Foundation as a successful model. This imaginative program is directed specifically at converting research on federal objectives into innovation in the private sector. It provides incentives for the small science and technology based firm, venture capital firms, private investors, large companies and universities to work together to explore and finance advanced concepts leading to new products, processes and services. This program provides strong incentives for the utilization of science to do new things.

The members of our Committee believe that it is essential that governmental policy-makers concerned with innovation make better utilization of incentives for the commercialization of research knowledge. We also believe that government must take steps to assure that the disincentives to private initative of deliberate pre-emptive and duplicatory work, and competition with the private sector at universities or government laboratories be prohibited, and that steps be taken to ensure that this prohibition is enforced.

AN ADVANCING SCIENTIFIC ENVIRONMENT IS ESSENTIAL FOR INNOVATION.

The final concern of the Committee is the health of science in America. U.S. science clearly leads the world with fifty percent of the total science based Nobel prizes during the past thirty years. While this science excellence has existed since World War II, the industrial competitiveness of U.S. technology has declined, and much of the benefits of our excellence in science has been transfered overseas. We have received little in return, except that we now import large amounts of foreign goods made possible by our scientific advancements. We must point out that small business does not establish and train our overseas technological competitors--small innovative businesses create jobs, income, and exports at home.

We must also comment upon what we believe to be an unhealthy mix of basic and applied research at our universities that is mandated by federal funding requirements. We support the principal that universities are a proper environment for much of our basic research. However, government support to universities for applied research has increased more than six times during the past twenty years, while industry's percentage has declined from approximately fifty percent to twenty percent.

Federal laboratories and non-profit institutions have also prospered in applied research funding. We must respectfully point out, however, that major innovations have not come out of our universities, federal laboratories, and non-profit institutions with a frequency comparable to those emanating from small businesses. We must again ask why we do not have more applied research conducted by small businesses.

While some individuals may claim that applied research in universities is necessary to train an increasing number of scientists and engineers, a 1979 Department of Labor report states that forty-seven percent of those who received doctorates between 1970 and 1977 were not able to get jobs in fields that required that level of education, and that this problem is projected to persist through 1985.

In summary, the Committee believes that there is a need to increase federal R & D expenditures and that this increase should go in new directions.

RECOMMENDATION # 5--CHANGES IN POLICIES FOR FEDERAL FUNDING OF R & D

. The decline in R & D expenditures as a percentage of Gross National Product must be arrested and re-directed upwards towards the goal of three percent by 1985.

. This increase should be heavily directed towards basic research at universities and applied research and development in the private sector, with strong incentives for commercialization.

. There should be decreased emphasis on applied research in universities, federal laboratories and non-profit institutions, particularly where such applied work might pre-empt private initiative or is duplicatory or competitive with private sector activities.

. Each federal agency should be directed to allocate at least ten percent of its R & D budgets to small business and increase current levels by one percent of its budget each year until the ten percent minimum is established, starting in 1980.

. Each year, starting in 1980, each agency with a budget of over $100 million for R & D should allocate at least one percent of its R & D budget to the small business program using the same format as that of the National Science Foundation but with their own research topics, and review and awards procedures. This program should be coordinated by an Inner-Agency Small Business R & D Committee chaired by the Small Business Administration.

. A clear federal policy should be established and enforced to prohibit federal funds from being used to finance projects that are competitive with or duplicatory of private sector technological developments, or in any other ways might prevent the establishment by small businesses of exclusive technological or intellectual properties in new areas of non-defense technological advancement.

* * *

FEDERAL PROCUREMENT POLICIES.

The U.S. government is the largest purchaser of goods and services in the world. Federal procurement policies greatly affect the ability and incentives for government contractors to innovate.

Unfortunately, federal procurement rules and their administration are grossly discriminatory against small businesses. Large corporations are able to follow changing trends well in advance in procurement and to influence specifications to favor their companies. They know the system, can handle it, and can afford large government marketing staffs to effectively compete. Small businesses, which have historically provided fifty percent of the most significant innovations, are essentially precluded from this process. We do not believe this is in the national interest. Small businesses need a greater opportunity to participate.

At present, the federal procurement system chews the small innovator to bits. The small firm has little negotiating power and cases of unfair discriminatory treatment against small innovative businesses are legion. For example, patent policies in some agencies result in patent rights being awarded to large contractors, yet small firms rarely are able to obtain patent rights under similar circumstances. In addition there are cases where patent rights developed at the expense of a small business have been required to be assigned to the government for use by others as a condition of the small firm obtaining a government contract.

Small businesses are further discriminated against in government payment procedures. Delays occur in receiving payments and the small business is less able to obtain low cost loans to carry overdue government receivables. In addition, debt service is not a reimbursable cost.

It is the opinion of this Committee that changes should be initated in procurement policies in order to encourage and allow greater participation by small innovative businesses on a more equitable basis.

RECOMMENDATION # 6--CHANGES IN FEDERAL PROCUREMENT POLICIES.

. Cost sharing requirements for research and development awards for small businesses shall be eliminated and negotiated, fees shall be allowed on all R & D awards;

. No federal agency shall exclude small business from a fair and equitable opportunity to compete on a merit basis on the same terms as other participants;

. No agency shall restrict opportunities for small businesses to submit unsolicited proposals and shall give such proposals a fair review based upon their merit. Each agency shall provide small firms opportunities to receive sole source awards;

. Independent research and development costs, and bid and proposal costs, shall be allowable costs for small business firms at a rate for small businesses of at least two times the level allowed for large businesses.

. A separate set of simplified Federal Acquisition Regulations should be developed to apply to small business firms;

. All proposals submitted by small business must be awarded or declined within four months of submission;

. Proposal evaluations shall consider total costs relative to the work proposed, and not consider overhead or indirect cost rates due to variations in institutional and company accounting practicies;

.. Fee negotiations shall take into consideration the level of interest rates and shall be higher in times of high interest rates than in times of low interest rates. All debt service costs shall be allowable costs for small businesses, and procedures should be instituted for prompt payments to small businesses, with late payment penalties;

. Every federal agency should study policies and procedures that discriminate against small businesses, and to institute changes that will equalize opportunity without harming the public interest.

* * *

PATENTS.

OUR PATENT SYSTEM HAS WEAKENED.

It is with alarm and consternation that we report two major weaknesses that have emerged in the patent system in recent years that are damaging incentives for innovation, particularly by small science and technology businesses. The usefullness of patents has diminished dramatically.

The first weakness is that judicial decisions, at the trial court level, are resulting in fifty percent of the patents issued by the U.S. Patent and Trademark Office being declared invalid when contested. In the ten circuit courts of appeal, this figure becomes seventy-two percent. As a result, the innovator seeking patent protection is inviting expensive litigation to test the validity of his patent, and the odds greatly favor his potential competitor, often a resourceful large corporation wishing to use his technology. A basic reason for such judicial invalidities is that the Patent Office did not have available to it, or was unable to identify, or failed to use, prior art that the courts declare as pre-emptive.

The second major weakness is that the cost incurred in defensive patent litigation sometimes approximates $250,000, which is usually an impossible burden for a small business. These developments are inhibiting to innovation and place the small innovative business in a position of not being able to benefit from the patent protection to which it is entitled and that may be necessary for its success.

It must be recognized that the reliability of patents is the keystone in the commitment of funds to carry out the commercialization of a patented (or potentially patentable) invention. Few entrepreneurs and investors are willing to risk time, energy and funds in the commercialization of an invention in a free market economy knowing that the path they are pioneering may soon be trod upon by others, including large firms with greater resources and with preferential access to the market for the new invention. As a result, the only legal method to protect newly pioneered technology is by maintaining new technology as a trade secret. Tying up significant discoveries and inventions in trade secrets is not in the public interest since knowledge transfer does not occur for others to use.

OTHER GOVERNMENT AGENCIES FAIL TO RECOGNIZE THE NECESSITY OF INITIAL EXCLUSIVITY FOR SUCCESSFUL INNOVATION.

Although our constitutionally provided federal patent system is intended to provide exclusive protection to inventors with novel contributions, the importance of this policy of exclusivity is frequently ignored by government. We believe that a change in attitude within government about exclusivity of technology by small business would substantially enhance innovation. Small firms pioneering new techniques are often treated as large resourceful corporations attempting to monopolize markets. In some cases government vigorously attempts to pre-empt or duplicate technology being pioneered by small firms in order to prevent initial exclusivity. The result is that in such fields where government R & D activities are pre-emptive or competitive, interest by entrepreneurs and risk capital sources diminishes. This Committee believes that there must be a greater awareness within government that exclusivity is frequently a substantial motivation in decisions to pioneer new fields.

It is unfortunate that the benefits of patent protection of inital exclusiviety have greatly diminished for small businesses and this trend favors large resourceful corporations that can afford expensive litigation. It is the small innovative businesses that make a far greater contribution to innovation in America that are being deprived of the protection necessary for them to become established. We therefore have the following recommendations for strengthening incentives for innovation provided by the patent system:

RECOMMENDATION # 7--CHANGES IN PATENT POLICIES.

. The Patent and Trademark Office should develop a practical and effective computer based search and retrieval system for its own use and public access, with particular concern for its usefullness for small business firms.

. A new mandatory re-examination procedure should be instituted in the Patent and Trademark Office whereby a litigant who raises a defense of invalidity of a patent based on new found heretofore unconsidered art should first test the assertion of invalidity in the patent office where the most expert opinions exist at a much reduced cost.

. The budget of the patent office should be increased sufficiently to allow for more thorough searching of prior art using the most modern search technology.

.The patent laws should be amended to recognize that the reliability of patents is a keystone in the commitment of funds to carry out commercializations of patented inventions, and incontestability should be mandated after a period of time so as to result in absolute reliability, except in cases of fraud.

. Legislation should be passed to give small businesses title to inventions made under government contracts, with the provision that commercialization be undertaken in a reasonable time. If such commercialization is not undertaken, title should revert to the government and the government should license small businesses. As an alternative, small business should be able to obtain title to inventions developed under government awards if they invest an amount of capital at least equal to the amount of the R & D award under which the invention occurred. Likewise, with inventions made in national laboratories, the government should preferentially license small business concerns.

. Small businesses should be able to obtain (with appropriate restrictions) compulsory licenses through suitable proceedings in cases where uncommercialized patents block entry into new markets.

. The Justice Department should be required to undertake competitive impact studies for taking anti-trust action against small business when a small business is attempting to exploit the full property rights afforded by its patent.

* * *

This report is only a brief compilation of the recommendations that we believe are important to lead to a renaissance in anti-inflationary technological innovation by small business enterprises. We hope that we have articulated the distinctive characteristics of the creative process in small businesses that are substantially different than the creative processes in large corporations. In most cases, the same government regulations, policies and processes applied to all businesses, in effect, discriminate against small innovative businesses.

The necessary exemptions and the special needs of small innovative businesses are usually discarded by federal policy makers because it is feared that they will be applied to all industry. Yet we believe that special considerations are usefull and tolerable if restricted by ceilings to levels meaningful to our sector of the American innovative community.

The issue of special treatment for small innovative enterprises in the formulation of laws, policies and governmental processes, is more than a matter of equity--it is a matter of national concern because of the far reaching ramifications of innovation in economic and social growth and the disproportionately large contributions of independent innovators. The potential for continued innovative contributions from small business is far too great to continue to be ignored, and meaningful special considerations must be made.

With the removal of the disincentives that are now imposed upon small innovative businesses, we are confident that the amazing resourcefullness of American innovators will again emerge and result in material social and economic growth for our country.

APPENDIX II

A Report to the Assistant Secretary of Commerce for Science and Technology

Commerce Work Group on
Job Creation

EXECUTIVE SUMMARY

Job shortage in the United States is the most important consequence of our recent decline in technological innovation. Jobs are at the heart of American society, but we don't have enough of them, and we aren't creating new ones fast enough, particularly skilled jobs.

The shortage of jobs underlies our blighted inner cities and proverty stricken rural areas where residents, reliant on welfare, are bereft of the means to regain control of their personal lives to rise above the squalor. It also underlies the unemployment rate of nearly 35 percent for minority teenagers. This means a paucity of career opportunities that will attract their commitment to self-improvement programs as realistic alternatives to lives dominated by despair, desolation, and crime.

The ability of our economy to carry out technological innovation -- to introduce commercially successful new products, services, and processes -- is the foundation of both our domestic prosperity and our international competitiveness. Because innovation is such a key factor in our economy, it supports much of our real economic growth, which in turn permits a rising standard of living and provides a solution to the stubborn problem of stagflation -- rising prices combined with high unemployment.

Internationally, our historic preeminence in technological innovation is being challenged by other industrial nations, Japan and West Germany in particular. The challenge is explicit. It is shown clearly by recent trends in several international economic indicators -- the falling value of the dollar, our declining share of world exports, and our negative trade balances in manufactured goods. Continuation of these trends promises the loss of U.S. leadership in technological innovation and a further deterioration of our economic health.

Given their brilliant performance of the 50's and 60's small businesses* again could play a major role in providing more jobs and

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* Throughout this report small businesses are defined as those that have less than 500 employees, are not majority owned by larger firms, are operated for profit, and are involved in the creation or creative use of new knowledge, products, processes, or services. Activities related primarily to real estate transactions are excluded.

RECOMMENDATIONS FOR CREATING JOBS THROUGH THE SUCCESS OF SMALL, INNOVATIVE BUSINESSES

A Report to the Assistant Secretary of Commerce
for Science and Technology

This report, prepared under the direction of William C. Norris, Chairman of the Board and Chief Executive Officer of Control Data Corporation and a member of the Commerce Technical Advisory Board, represents the views of a Work Group of private citizens, each of whom has had unique and valuable experience in technology and entrepreneurship.

December, 1978

make significant contributions to the solutions of the underlying problems of our economy. The performance of the small business sector could be stimulated to provide these benefits by changes in federal policy and commercial practices and without increases in federal budget support. Whatever early losses in federal revenues they may cause are expected to be offset by subsequent gains from the resulting spurt in economic activity.

Throughout most of our history, small enterprises have produced many of our best jobs; a large proportion of the new products and services that have made us the world's leading nation in science, engineering, and technology; and a steady supply of creative entrepreneurs. But the contributions of small firms have sharply declined over the last decade. We believe the underlying causes are mainly certain growth-inhibiting government policies.

One is the increase in capital gains taxation, which has greatly reduced the availability of capital for small businesses. Another is increased regulatory barriers inhibiting the access of small firms to the capital market. A third is the continuing concentration of research and development effort in a few industries and in relatively few firms within those industries, and little incentive to diffuse technologies.

Increased technological innovation appropriate to the small family farm and food processor is also needed. Rising costs of energy, plateauing productivity of major food crops, increasing scarcity of water, continuing high levels of pollution, and decreasing fertility from erosion mandate that small farms and food processors also be made significant and lower-cost contributors to the nation's food supply.

The overall objectives of the recommendations in this report are:

1. To assure that the small enterprises regain their previous economic vitality, and
2. To foster the viability of the small family farm and small food processor through development and application of technologies that require less capital and fossil fuel, and are more conserving of other natural resources.

The following 12 recommendations are directed to changes in federal policies and commercial practices in five categories:

●●● Increasing the availability of capital and management expertise in small businesses (Recommendations 1-5).

●●● Reducing the burden on small businesses of compliance with government regulations (Recommendation 6).

●●● Stimulating the diffusion to and more effective application by small businesses of the technology developed in government laboratories and large businesses (Recommendations 7 and 8).

●●● Increasing the amount of R&D performed by small businesses and its utility to small farms and food processors (Recommendations 9, 10, and 11).

●●● Stimulating the export performance of small businesses (Recommendation 12).

While we recognize the potential significance to small businesses of issues relating to the U.S. patent system and federal patent policy, we exclude recommendations for policy changes in this area because it is under active review by the Domestic Policy Review on Industrial Innovation and by the Committee on Intellectual Property and Information of the Federal Coordinating Council for Science, Engineering, and Technology.

The complete text of each recommendation follows:

Recommendation 1.

We recommend that the capital gains tax rate be reduced to 25 percent (the pre-1969 rate) on the capital gains realized from the sales of stocks of small businesses (less than 500 employees at date of purchase) whenever such stocks have been held for more than three years, with a rate of 10 percent for the capital gains of investors in the smallest businesses (less than 100 employees at date of purchase). The reduced rates would not apply to capital gains realized from the sale of real estate. (Pages 15-18)

Recommendation 2.

We recommend deferral of capital gains taxes on the sales of stock if the proceeds are reinvested within one year in small businesses, except those whose principal activities are real estate transactions. (Pages 18-19)

Recommendation 3.

We recommend that the threshold for application of the full corporate tax rate of 46% be raised for small businesses from $100,000 to $200,000 of annual net income; and for annual net income below $200,000 a progressive rate schedule beginning at 10% on the first $50,000, and increasing in 10% increments to $200,000 on each additional $50,000. In addition we recommend that the carry-forward provisions for start-up losses of small businesses be extended from five to ten years. (Pages 19-20)

Recommendation 4.

We recommend restoration of the Qualified Stock Option Plan for Key Employees of small businesses. (Pages 20-21)

Recommendation 5.

We recommend (1) that ERISA's prudent man standard be restated so that it is clearly applicable to the total portfolio of pension fund investments rather than individual investments, and (2) that pension fund managers explicitly be permitted to invest up to five percent of pension fund assets in small firms. (Page 21)

Recommendation 6.

We recommend that small businesses be allowed to deduct twice their payments for regulatory advisory services related to compliance with federal, state, and local regulation. (Pages 22-23)

Recommendation 7.

We recommend that each federal agency allocate five percent of its R&D funds for technology transfer. These funds should be used to establish well defined and organized programs of technology transfer in which there are incentives to individual researchers to contribute their time and skills to the identification of commercial applications. Such incentives should be related to the benefits realized from technology transfer. (Pages 23-26)

Recommendation 8.

We recommend that private sector individual or corporate owners of technology be rewarded, through appropriate changes in the tax code, for selling, leasing, or licensing their technology to small business firms in the United States. In addition, we recommend the establishment of a voluntary national policy to encourage companies to make their technologies available for uses by others. (Pages 26-27)

Recommendation 9.

We recommend that each federal agency receiving R&D funds by appropriation from the Congress be required to allocate at least 10 percent of all such funds (excluding those for basic research) to small businesses and that this objective be achieved in annual one percent increments beginning in FY1980. (Pages 27-30)

Recommendation 10.

We recommend that small business firms be allowed to establish and maintain a reserve for R&D for use in times of financial stress. (Pages 30-31)

Recommendation 11.

We recommend that there be some redirection of federally supported agricultural research to the development of technology for improving the efficiency of small family farms and food processors and for making food production, transportation, and preservation less capital and fossil-fuel intensive. (Pages 31-33)

Recommendation 12.

We recommend that the creation of Small Business Export Trade Corporations be encouraged by a double deduction for these corporations of up to $100,000 of annual expenses associated with the exporting activities of each client, with a loss carry-forward of ten years. In addition, we recommend that small businesses be allowed a double deduction of special expenses of serving export markets up to $100,000 annually. (Pages 33-34)

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I. INTRODUCTION

This report recommends changes in federal policies to increase the contributions of small, technologically innovative firms to.our society. We define such firms as those that have less than 500 employees, are not majority owned by larger firms, are operated for profit, and are involved in the creation or creative use of new knowledge, products, processes, or services. We exclude throughout the report activities related primarily to real estate transactions.

The small business sector no longer contributes as much to economic prosperity as it so brilliantly did in the fifties and sixties. The loss is not just for the few that might have had the satisfaction of technological entrepreneurship; more importantly it is a loss for all Americans who would have shared in the abundant economic benefits and would have held the myriad of skilled jobs that such pioneering would have made possible.

More innovation means more skilled jobs for an increasingly educated population, an improved export performance, a higher rate of productivity improvement, and at least a partial solution to stagflation, a crippling combination of inflation and unemployment. Further, we desperately need more innovation to cope with both new problems and widely accepted national goals - - better central cities, safer and more satisfying work, a cleaner environment, and less dependence upon autocratically controlled overseas sources of energy supplies. We need to recognize the growing concern over the quality of life in our country - - concern that technological innovation is not focusing adequately on both life's necessities of food and housing and on the amenities that make life more enjoyable. We think commercially successful innovation is like good health: a society can never have too much.

Our concerns span the entire spectrum of requirements for successful innovation - - from the inception of the research and development (R&D)[1] to the widespread use of a new product, process, or concept. We look then well beyond research and development (that is, activities to create new knowledge or design) to encompass the introduction and diffusion of an invention through its commercial application that creates jobs, increases productivity, and adds to exports. Thus successful innovation requires a combination of market demand (need), technical feasibility, and commitment of financial support. This combination ultimately is manifested in the establishment of all of the producing and marketing facilities required for national and international distribution of the product or service. Hence, our report deals not only with the role of scientist, engineer, and inventor, but also that of the financier, the production craftsman, and the marketing person; all are involved in bringing an invention into widespread use.

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[1] Research and development includes (1) basic research (acquiring scientific knowledge), (2) applied research (acquiring knowledge for potential application), and (3) development (designing special materials, devices, processes, and products).

We recognize that federal policies alone cannot cause small, technically oriented firms to flourish. Their existence depends on the entrepreneurial spirit that has been an integral part of our culture and institutions, and they have contributed importantly to our economic strength. Other industrialized countries do not have so large a sector of technically oriented small businesses, which explains in large part their historic lack in innovation. In recent years, however, they have recognized this deficiency and instituted policies to encourage the development of small technically oriented companies. At the same time, policy changes in the United States have had largely unintended adverse consequences.

Our recommendations are to reshape certain existing policies to make them less of a handicap to business, rather than to expand the government into new areas. We stress that our recommendations involve no increase in federal budgetary support, but they probably would cause an initial reduction in federal revenues.

The report is focused on what can be done: measures that will pay off to society. As a prelude to such recommendations, we believe it is important to review briefly what we regard as the present crisis in innovation and its consequences.

II. CONSEQUENCES OF THE SLOWDOWN IN INNOVATION

The loss of the potential contribution of the small, technically oriented firm and more generally the decline in innovation in our economy have wide-ranging ramifications for jobs in the United States, our trade position, our productivity, the general performance of our economy, and our ability to meet the new problems our society faces.

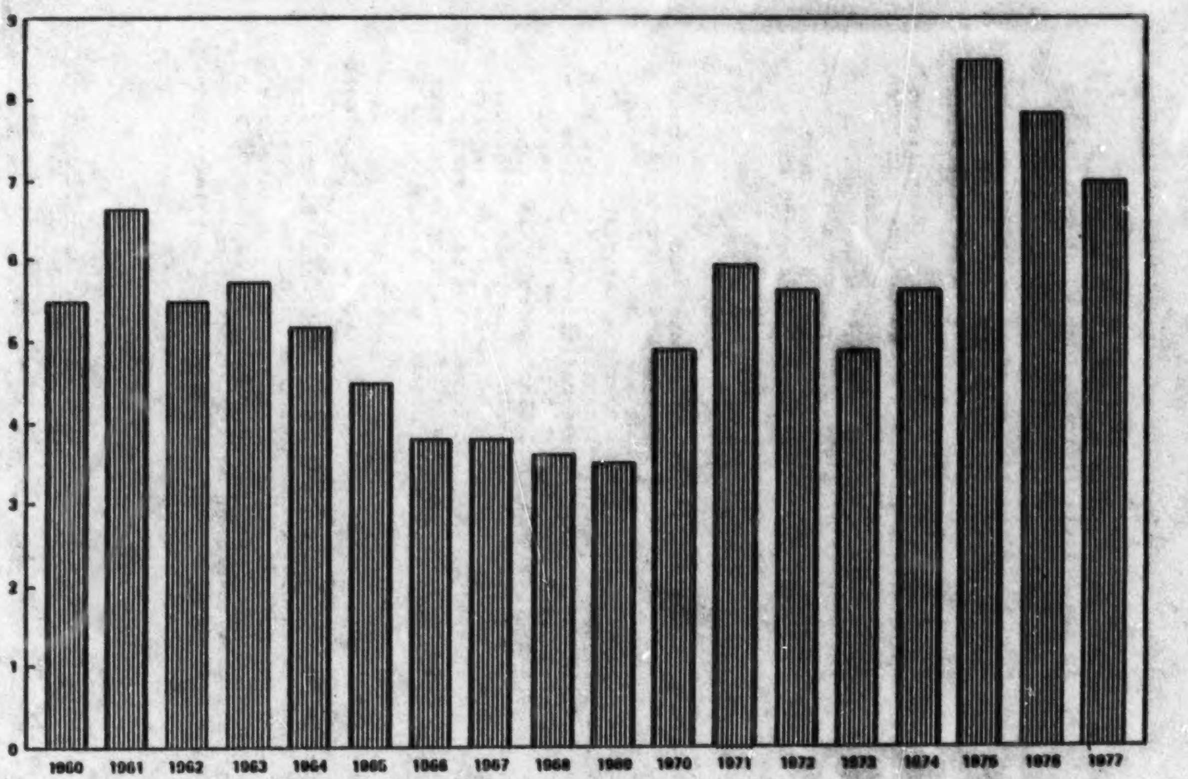
A. Jobs

Unemployment in the United States throughout the nineteen seventies has persisted at unacceptable rates (See Figure 1.). It is increasingly recognized as a stubborn problem that is not solvable by fine tuning of national fiscal and monetary policies. Nor is the creation of temporary and dead-end jobs in the public sector more than a palliative. Training programs go nowhere without viable jobs for their graduates.

Holding a meaningful skilled job is also recognized as the means of admission to most of the benefits of a prosperous society and to full citizenship in economic, social, and political life for an individual and his family. Alternating periods of unemployment and dead-end jobs leave their scars on successive generations.

Finally, the concentration of unemployment and underemployment among particular groups and localities means explosive social problems. The consequences of unemployment spread through the neighborhood to encompass its small businesses, its public services, and its education system so as to poison the social atmosphere of sections of our country.

United States, 1960-77, in Percent of All Workers



SOURCE: 1960–69, INTERNATIONAL ECONOMIC REPORT OF THE PRESIDENT, WASHINGTON, 1977, p. 146
1970–77, ECONOMIC REPORT OF THE PRESIDENT, WASHINGTON, 1978, p. 291

Figure 1. Unemployment in the United States, 1960-77, in Percent of All Workers

The solution must be found in job creation - - particularly skilled jobs - - in the private sector. Innovation plays a key role, for high employment has been associated with the development of new industries and products, founded on new technology; and small businesses have an impressive record of creating new jobs through new technology. A previous study for the Commerce Technical Advisory Board found that from 1969 to 1974 employment increased at an annual rate of only 0.6 percent in a sample of large mature companies, at a rate of 4.3 percent in established but innovative companies, and at a rate of 40.7 percent in young high technology companies.[2] (See Figure 2.) Of course, the success of new products may result in the displacement of old products. Still the process of innovation - - the adding of new products to the economy - - stimulates demand and investment. It permits noninflationary growth in overall demand and offers escape from the dilemmes of continuing stagflation.

B. Export Performance

The strength of the dollar rests ultimately on our success as a trading nation. The postwar pattern in U.S. trade is a relatively simple one. We have deficits - - more imports than exports - - in minerals, fuels, and other raw materials as well as in less technologically intensive manufactured products such as textiles and shoes. We cover these deficits by surpluses - - more exports than imports - - in such technologically intensive products as aircraft, chemicals, and electronics. Also contributing significantly to the surplus is trade in agricultural products. Much of our success in agriculture is based on the high level of innovativeness displayed by American farmers and their supplying industries, underscoring the importance of including small farms and small food processors within the concept of innovative small businesses.

While our trade in agricultural products continues to provide a significant surplus (See Figure 3.), the recent record of trade in manufactured products is depressing. As shown in Figure 4, the U.S. share of world exports of manufactured goods has dropped alarmingly over the past 20 years. Traditionally, we have been a net exporter of manufactured products, but our imports of such products by 1972 grew to exceed exports, creating one of the factors in the U.S. devaluation decision. With the price advantage

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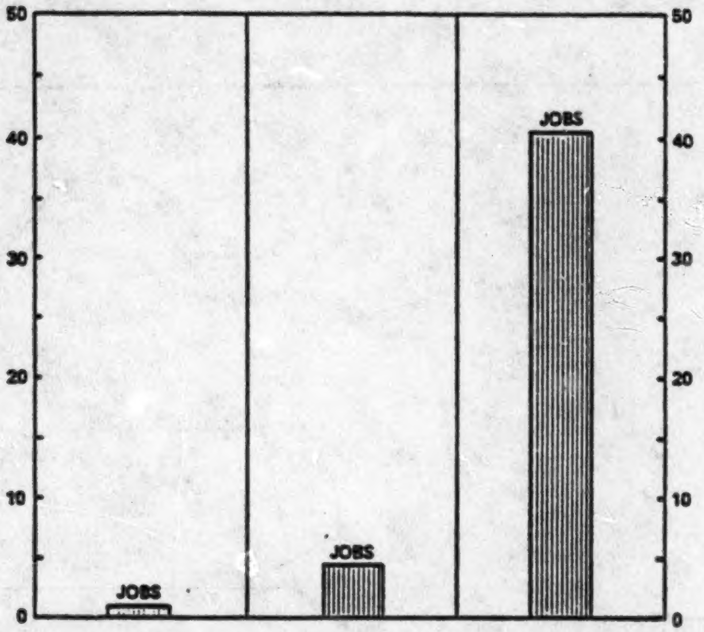
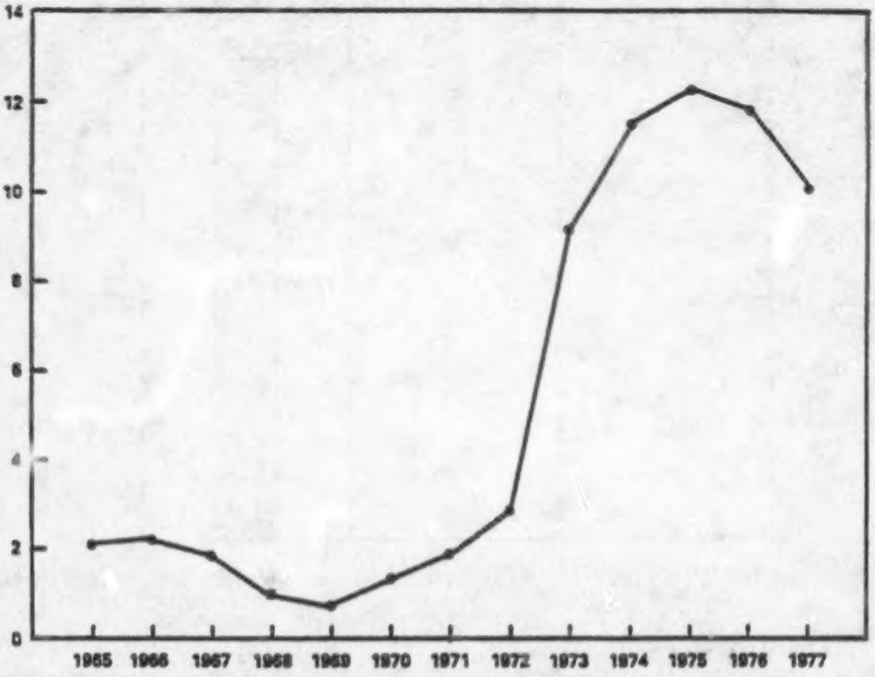
[2] The Role of New Technical Enterprises in the U.S. Economy (A Report of the Technical Advisory Board to the Secretary of Commerce, 1976) Appendix A. See also the statement of Dr. Edwin V.W. Zschau, Chairman, Capital Formation Task Force of the American Electronics Association, before the Senate Select Committee on Small Business, February 8, 1978.



MATURE COMPANIES:	INNOVATIVE COMPANIES:	YOUNG HIGH TECHNOLOGY COMPANIES:
BETHLEHEM STEEL	POLAROID	DATA GENERAL
DUPONT	3M	NATIONAL SEMICONDUCTOR
GENERAL ELECTRIC	IBM	COMPUGRAPHIC
GENERAL FOODS	XEROX	DIGITAL EQUIPMENT
INTERNATIONAL PAPER	TEXAS INSTRUMENTS	MARION LABS
PROCTOR & GAMBLE	(1953–74)	

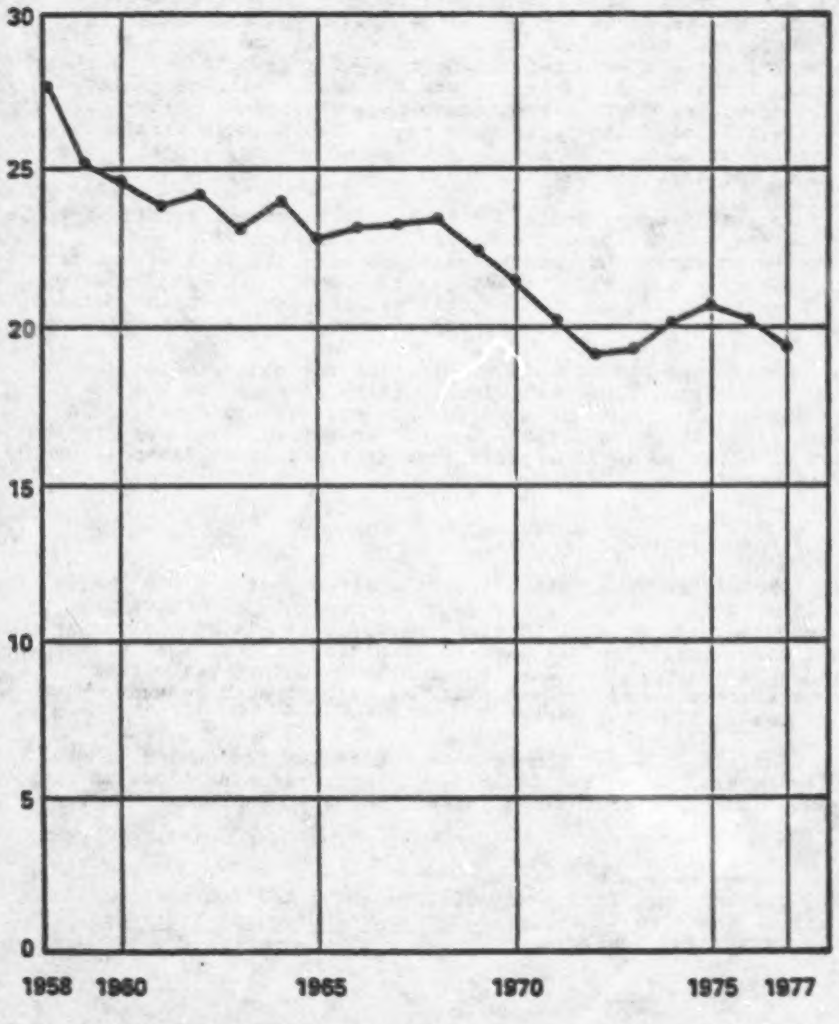
SOURCE: THE ROLE OF NEW TECHNICAL ENTERPRISES IN THE U.S. ECONOMY. A REPORT OF THE COMMERCE TECHNICAL ADVISORY BOARD TO THE SECRETARY OF COMMERCE, JANUARY 1976, p. 2.

Figure 2. Average Annual Growth of Jobs in Innovative Companies, Mature Companies, and Young High Technology Companies, 1969-74, in Percent (Compounded)



SOURCE: 1965–76: INTERNATIONAL ECONOMIC REPORT OF THE PRESIDENT, JANUARY 1977, p. 151. 1977: U.S. DEPARTMENT OF COMMERCE, OFFICE OF INTERNATIONAL ECONOMIC RESEARCH.

Figure 3. U.S. Foreign Trade in Agricultural Products, 1965-77 (Balance in Billions of Dollars)



SOURCE: COMMERCE AMERICA, JUNE 19, 1978, p. 9.

Figure 4. U.S. Share of World Exports of Manufactured Goods, 1958-77, in Percent

from the 1973 devaluation, trade in manufactured products by 1975 generated a 22 billion dollar surplus. By mid-1978, however, our trade surplus in manufactured goods disappeared, which also demonstrates the decline in the U.S. competitive position in manufactured products. (See Figure 5.)

The decline in the balance of trade with respect to manufactured products underlines the importance of continued innovation. Economists have shown the existence of a product cycle in which new products tend to be developed and introduced in industrialized countries and particularly in the United States. Such products are exported to the rest of the world in their early years. But as products become standardized, their technology well known, and their market acceptance widespread, other countries, especially those with lower wage rates, begin their manufacture, first for their home market, and then for export, and at times even to the innovating country.[3]

In this product cycle our advantage has traditionally been in innovation and, as products mature, we must innovate new or improved products and create new processes. In this way we can remain both a successful trading nation and a high-wage country. The American trade problem originates, in part, with the declining innovativeness of our economy relative to those of other countries.

Another of our advantages has been the high productivity of our agriculture. The small family farm, however, is not realizing its potential in contributing to both agriculture exports and domestic consumption because not enough agricultural research has been directed to technological innovations that are responsive to its needs.

C. Productivity

One way the U.S. can offset the effects of its high wages in international competition is by increasing productivity - - more output per worker. Greater productivity is also significant domestically for it permits combining rising wages with stable prices. And in the long run, more output per worker creates the economic growth that has allowed each generation to live better than its parents.

While output per man-hour in manufacturing doubled in the United States from 1950 to 1976, it increased nine times in Japan, more than four times in West Germany, and nearly four

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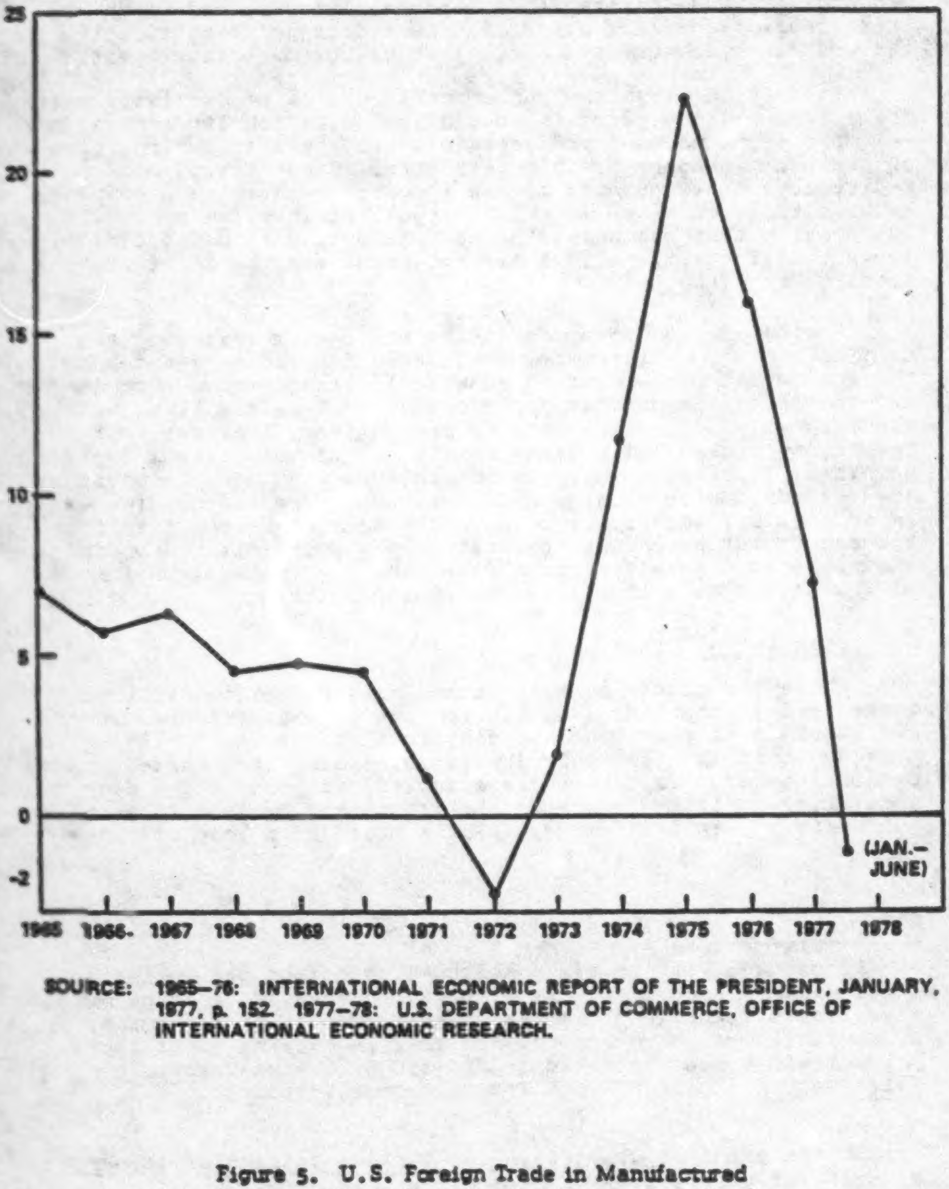
[3] Raymond Vernon, "International Investment and International Trade in the Product Cycle, "Quarterly Journal of Economics, Vol. LXXX (May, 1966).



SOURCE: 1965–76: INTERNATIONAL ECONOMIC REPORT OF THE PRESIDENT, JANUARY, 1977, p. 152. 1977–78: U.S. DEPARTMENT OF COMMERCE, OFFICE OF INTERNATIONAL ECONOMIC RESEARCH.

Figure 5. U.S. Foreign Trade in Manufactured Goods, 1965-78 (Balance in Billions of Dollars)

times in France. Among the industrialized countries, only the United Kingdom had an increase comparable to that in the United States. (See Figure 6.) While the record of other countries reflects a recovery from World War II destruction, and some catch-up in productivity was inevitable, the productivity record of the United States during the last decade has been disappointing relative to that of other countries, and to that of our own recent past.

Innovation plays the fundamental role in productivity gains. The effect of innovation is most direct with process innovations -- improved methods of producing existing products which raise output per man-hour. New products affect productivity more indirectly. A new product of one industry -- such as a computer, a machine tool, or a new material -- will often raise productivity in the firm that purchases the new product. Various studies have shown that innovations in these two forms are the major sources of productivity growth.[4]

Another factor in productivity has been the rise of the service sector. While services broadly defined were about half the economy at the end of World War II, services now account for two-thirds of the U.S. economic output.[5] Services have traditionally had a slow rate of productivity increase, but the reduction in clerical costs with the use of computers and office machines illustrates what can be achieved with new products and new methods. With a large and growing service sector, innovation is of critical importance both in the service sector itself and in the manufacturing industries that supply both improved products and new ones. Moreover, in the service sector small businesses play a larger role than they do in manufacturing.

D. Stagflation

While the causes of stagflation are not well understood, there is evidence that a declining rate of innovation compounds and intensifies the forces leading to stagflation. This is because it is in the highly innovative sector that marked price declines occur. To take three examples from innovative industries: (1) the price of the transistor by 1965 fell to one hundredth of its 1951 value, (2) the price of a long distance

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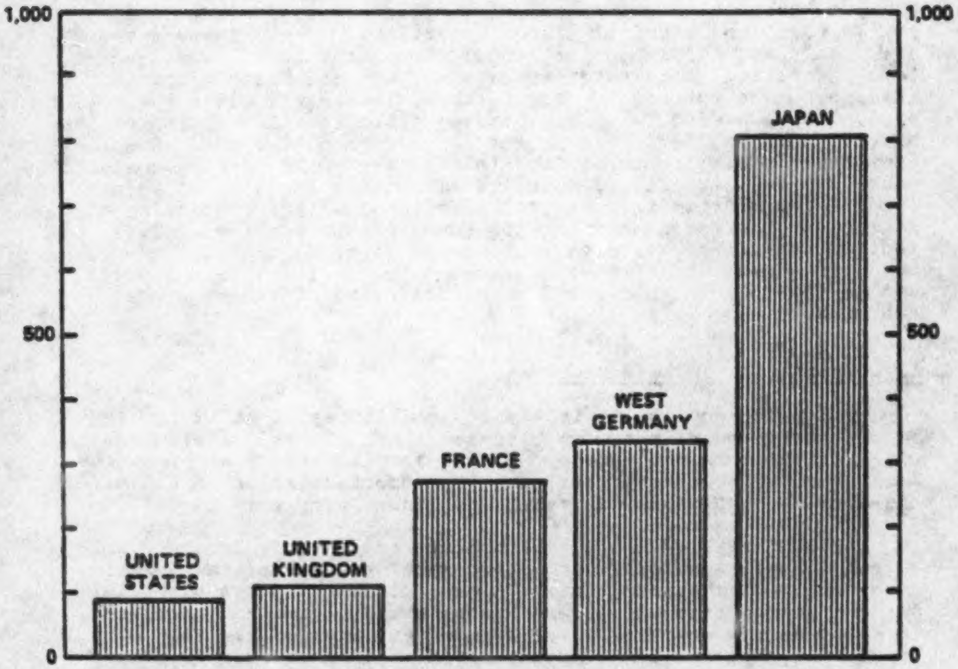
[4] While productivity is often measured as output per worker, total factor productivity is a more comprehensive measure because it reflects the role of increased capital per worker. Again, however, innovation plays the key role in raising total factor productivity. See, for example, Edward S. Denison, Why Growth Rates Differ (The Brookings Institution, 1967), pp. 7-9.

[5] U.S. Department of Commerce, U.S. Service Industries in World Markets (1976), p. 7.



SOURCE: "OUTPUT PER HOUR, HOURLY COMPENSATION, AND UNIT LABOR COSTS IN MANUFACTURING, ELEVEN COUNTRIES, 1950–77," BUREAU OF LABOR STATISTICS, U.S. DEPARTMENT OF LABOR, MAY 4, 1978.

Figure 6. Output Per Hour in Manufacturing (Increase in Percent, 1950-76)

telephone call by 1970 was half its 1950 price, and (3) the price of a standardized calculation on a current model computer in 1977 was one percent of what it was in 1957.[6] Such sharp price reductions contribute to price stability by offsetting price rises elsewhere in the economy.

Innovation has also made American agriculture the most productive in the world. The American farmer now feeds 55 of his fellow countrymen compared to 7 in 1900. A substantial part of the gain in agricultural and food processing productivity has been achieved through intensive use of large-scale capital equipment, fossil fuel, and chemical based innovations. These innovations are mostly applicable to the larger farms, and small farms and food processing units have not received the attention warranted by their economic potential. Furthermore, the recent slowdown in agricultural productivity suggests that the traditional approaches have diminishing returns even for large farm operations. The inexorably rising costs of food in a hungry world, rising cost and uncertain availability of fossil fuels, the plateauing of major food crop productivity, growing scarcity of water, continuing high rate of soil erosion, and growing concern over quality of life indicate that innovation in agriculture is still urgently needed but with a redirection toward technologies that are less capital and fossil-fuel intensive and more conserving of other natural resources.

E. Innovation and New Problems

Today the economy is faced with challenges of achieving a better environment, renewing blighted inner cities, developing alternative sources of energy, and conserving energy and resources. Small innovative enterprises can play important roles in all of these areas, especially in rebuilding inner city communities.

With innovation, new opportunities and options become available for new, technically oriented, small businesses in revitalizing inner city communities. These include new types of building design, construction, and renovation; installation and maintenance of solar energy devices; urban farming and small-scale food processing; specialized computer-based education training centers; technology application centers; health care centers; and private delivery of welfare services. Widespread participation in small enterprises gives control to residents of the inner city and provides them the long-absent economic opportunity and incentives for success. Most importantly, urban revitalization that is based on diverse profitable enterprise rather than a host of public programs will provide a community the means of being self-sufficient and responsive to changing needs from within.

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[6] Data for 1 and 2 from Burton Klein, Dynamic Economics (Harvard University Press, 1977) pp. 130 and 138; for 3, Control Data price/performance records on central processing units.

F. The Unnoticed Crisis

By its nature a decline in innovativeness is not readily perceived. We do not see this crisis the way we see the urban decay or the lines at the employment office. But we think this unnoticed crisis underlies in large part our visible crises.

The Work Group believes that innovativeness in U.S. industry has declined substantially over the past decade. We also believe that an important factor in the decline is a series of difficulties besetting small, technically oriented firms. Because small firms have been found to have a much greater efficiency in innovation, a general decline in U.S. innovation could be expected if our small, technologically innovative businesses were to fall upon hard times.

Quantitative evidence corroborating this hypothesis is scarce, but support is contained in a study commissioned by the National Science Foundation and completed in 1975.[7] The study reported that in the 1953-73 period, about half of the major innovations produced in U.S. industry were made by firms with less than 1,000 employees and about one-quarter by firms with less than 100. Also reported in the study was a significantly sharper decline in the number of major innovations per sales dollar attributable to smaller firms (less than 100 employees) since 1967 than in larger ones (more than 1,000 employees): 33 1/3 percent compared to 21.1 percent. The decline in innovation has been accompanied by the virtual disappearance of seed venture capital to support the establishment and growth of small, technically oriented firms. (See Figure 7.)

This less visible crisis may contribute to some of the more visible problems - - the deficit in the balance of payments and weakening of the dollar, the productivity slowdown, and the devastating effects of stagflation on jobs, urban blight, and our standard of living - -all of which gives an urgency to the consideration of measures to reverse this decline, and to permit small, technically oriented firms to make again the contributions to the economy they achieved in the fifties and sixties. It is to these recommendations that we now turn.

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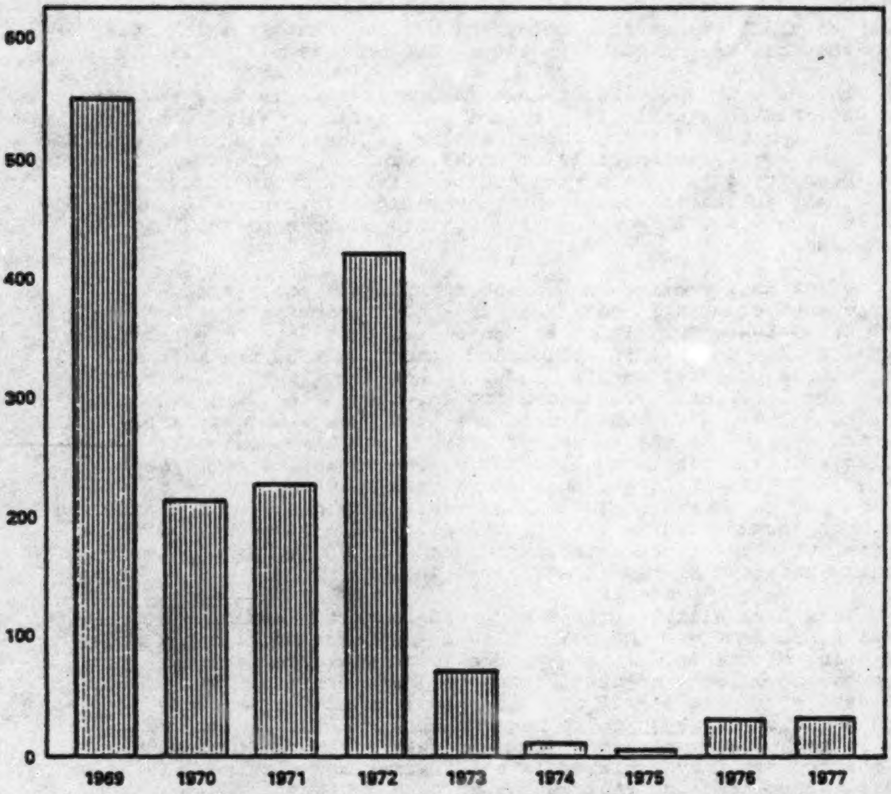
[7] William K. Scheirer, Small Firms and Federal R&D (Washington) p.9. See also Richard O. Zerbe, Jr., "Research and Development By Smaller Firms", Journal of Contemporary Business, Spring 1976.



SOURCE: REPORT OF THE SBA TASK FORCE ON VENTURE AND EQUITY CAPITAL FOR SMALL BUSINESSES, U.S. SMALL BUSINESS ADMINISTRATION, JANUARY 1977, p. 13 (1969–75); GREYLOCK MANAGEMENT CORP. (1976–77).

Figure 7. Number of Small Company Public Issues, by Years

III. RECOMMENDATIONS FOR RESTORING AND ENHANCING THE VITALITY OF SMALL TECHNICALLY ORIENTED BUSINESSES

A. Increasing the Availability of Capital

Access to the public securities market for all business firms is controlled by regulations of the Securities and Exchange Commission. Full compliance with these regulations, which is necessary to protect the interests of investors, can be excessively burdensome to business firms, and especially so to small business firms. In recognition of this principle, the SEC created Regulation A, which facilitates small securities offerings by exempting them from the costly and time consuming requirements of full registration. Over time, the value of the exemption was reduced markedly because of inflation. The SEC has, however, recently raised its ceiling and also modified Regulations 144 and 146 so as to facilitate the sale of equities in small businesses by major stockholders. With these changes in securities regulation, the major barrier hindering access to the securities market by small businesses lies in the tax laws. It is to be hoped that the SEC will review its regulations on a regular basis and revise them periodically so as to minimize their adverse impact upon small businesses.

SEC regulations are one illustration of the way government policies shape the structure of capital markets. Actions of other government agencies also have an impact. We believe that the combined effect of policy changes over the past decade has served to place small companies at a disadvantage with respect to access to capital markets.

Policy changes have also made the climate for investment in small businesses more unpredictable. Small operations are inherently fraught with uncertainty, and abrupt changes in government policy compound these uncertainties, making investment in small businesses excessively risky.

We believe government policy must create a more favorable and predictable climate for small business investment. Towards this goal, we recommend five specific actions that reverse the trend of placing small businesses at a disadvantage in obtaining capital and key personnel.

1. Taxation of Capital Gains

- Changes in capital gains taxation are probably more responsible than any other factor for the deterioration in technological entrepreneurship that has occurred in the United States during the last decade. Such changes successively have lowered after-tax returns for successful innovation to a level where now, technologically innovative firms no longer are able to attract adequate investment. The present level of capital gains taxation has become a critical constraint on the founding and expansion of small, technically oriented firms.

Engaging in industrial innovation is inherently risky because uncertainties of development of new technology are compounded by uncertainties of market acceptance of new products, processes, and services. At the same time innovation is a capital intensive activity, not because it requires such massive investment as steel and chemicals, but because of the time lag between launching a development and its large-scale market acceptance. Capital is required to cover the expenditures for start-up costs before revenue begins to be realized. Such capital is forthcoming only when potential investors believe that the after-tax returns will be adequate to cover the risks. The problem of adequate rewards, however, is not just one for capital; key management and technical personnel traditionally have been compensated for the personal risks in joining uncertain ventures by sharing in the fortunes of the firm rather than by salary payments. In our free enterprise system successful technical entrepreneurship creates the economic values. These, in turn, are reflected in the rise in stock prices of the enterprise and realized by investors and key individuals by the sale of their stock in such enterprises. Thus the after-tax capital gain is the critical incentive for technical innovation by small firms.

Since 1970, the tax on capital gains has increased dramatically. Prior to 1969, the maximum capital gains tax rate paid by individuals was 25 percent. The Tax Reform Act of 1969 increased that rate to a maximum of 40 percent -- a 35 percent rate on the capital gains themselves and an additional 5 percent possible from the operation of the minimum tax. Legislation also reduced the tax on earned income from a maximum rate of 70 percent to 50 percent.

Thus the differential between the taxation of salaries and capital gains narrowed from 70 percent on salaries and 25 percent on capital gains to 50 percent and 40 percent respectively.[8]

The Tax Reform Act of 1976 provided for further increases in the minimum tax and also raised the maximum rate on capital gains to 49.5 percent. These changes virtually eliminated the differential between the rates on earned income and capital gains. The effect of these changes was further compounded by a high rate of inflation which produced significant capital gains in current dollars, and hence capital gains taxes, for assets whose value after adjustment for inflation had actually declined. The impact of such changes in taxation has been dramatic for the small, technically oriented firms in which the prospect of capital gains has been the major incentive for investors. Therefore, we place the highest priority on a capital gains tax reduction targeted on small, technically oriented firms.

We consider such tax reduction a preferred method of improving the availability of capital to small, technically oriented firms. By increasing the rewards for successful ventures, an incentive is provided to manage such enterprises in an efficient way, leaving to the marketplace the distribution of the incentives among firms. Thus such an approach is preferable to the provision of loans or other federal financing to small firms, an approach that would thrust upon the federal government the difficult task of deciding among promising loan applicants. We recognize that our proposal might result in an initial revenue loss to the federal government, but given the narrowly limited target of the proposed tax reduction, it would be a minimal one, and losses would be offset by the gains in employment and output from these successful firms.[9]

The 95th Congress recognized the negative consequences of the present high rate of capital gains tax by passing significant rate reductions. The legislation, however, does not restore the 1969 rates. Given the risks of small, technically oriented businesses we consider such a rollback essential for these firms to realize their potential in such vital areas as job creation. We also consider essential an even lower rate of 10 percent to attract investment in the smallest of businesses — for example, those with less than 100 employees. Application of the lower rate would be determined by the size of the businesses at the time the investment was made and thus serve to attract capital to new firms and to recognize the higher risk of investment in the smallest firms. We would exclude from the rollback all real estate activity, because such transactions do not have as high a potential for job creation as investment in other small businesses.

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[8] Tax Policy, Investment and Economic Growth (A Report by Securities Industry Association, 1978) p. 63.

[9] Michael K. Evans. The Economic Effects of Reducing Capital Gains Taxes. Chase Econometrics Associates, Inc., April 1978. See also Tax Policy, Investment and Economic Growth, pp. 34-7.

Recommendation 1.

We recommend that the capital gains tax rate be reduced to 25 percent (the pre-1969 rate) on the capital gains realized from the sales of stocks of small businesses (less than 500 employees at date of purchase) whenever such stocks have been held for more than three years, with a rate of 10 percent for the capital gains of investors in the smallest businesses (less than 100 employees at date of purchase). These reduced rates would not apply to capital gains realized from the sale of real estate.

2. Tax-free Exchange of Stock

Continued investment even in successful, technically oriented, small firms whose stock has risen in value usually remains risky. Stockholders have a propensity to diversify their investment. Under present tax laws often the most profitable way to diversify is through merger with a large firm, carried out by a tax-free exchange of stock. Investors find that equity shares of large firms are likely to be more liquid and represent a diversified set of economic activities. Yet this method of diversification tends to concentrate capital in larger firms.

We consider it important instead to have tax policies that encourage the use of capital in the start-up of new firms. At the same time we recognize that that investor's desire for diversification of his risk is a legitimate one. Therefore we would like to establish an alternate route for tax-free diversification of risk that would encourage the formation and growth of small firms by allowing the tax-free rollover of investment in one small firm to another such firm.

We think such a provision -- similar to the rollover provision on sale of homes -- would make funds available to new, small, technically oriented firms, precisely from the most knowledgeable and receptive investors -- those that have already participated in such ventures. It would remove the tax incentive for the premature sale of successful firms to large firms and thus serve to retain at least some of them as independent business entities during their dynamic early stages of growth. Further, it would allow the investor to diversify by holding stock in several small, technically oriented firms.

Essentially the same proposal was made in 1976 by the Tax Policy Task Force of the Small Business Advisory Committee on Economic Policy.

Recommendation 2.

We recommend deferral of capital gains taxes on the sales of stock if the proceeds are reinvested within one year in small businesses, except those whose principal activities are real estate transactions.

3. Taxation of Corporate Income and Tax Treatment of Start-up Losses

Taxation of Corporate Income. Not only have small businesses experienced great difficulty in obtaining capital in their start-up period, but they continue to have trouble finding capital for financing expansion during their early years of existence. Although quantitative data are not readily available, capital shortage is believed to contribute significantly to the high failure rate of small businesses.

Causes of capital shortages in business firms range over a broad spectrum, but in the case of small young companies that are bringing new products or services to market, current tax rates on net earnings are so high as to preclude establishing a solid financial base that is attractive to investors. The best and easiest way for small firms to achieve a sound financial base and adequate funds to support expansion is, of course, through retained earnings. Current tax rates on corporate earnings are not, however, sufficiently differentiated between small firms and large established corporations, although the reductions made by the 95th Congress in the corporate tax structure were a step in the right direction. Before the 1978 reductions, net earnings by all companies, regardless of size and age, were subject to a tax of 20% on the first $25,000 of net income, 22% on the next $25,000, and 48% on income over that amount. In 1978, Congress lowered these rates to 17% on the first $25,000 of net income, 20% on the next $25,000, 30% on income between $50,000 and $75,000, 40% on income between $75,000 and $100,000, and 46% on income over $100,000. Most states also collect income tax on small businesses, and many in addition impose taxes on dividends to stockholders.[10] We believe small businesses would have better chances for survival and growth if the tax rates on net earnings were reduced further.

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[10] Tax Review, Vol. XXXVIII, No. 12, December 1977, p. 47.

Tax Treatment of Start-up Losses. The established corporation is provided a tax incentive for innovation in that its expenses for the early phases of innovation are a deduction from its corporate income tax. The new firm cannot obtain the same tax benefit since it lacks profits from which losses can be deducted. Such losses can, however, be carried forward and charged against income in subsequent years, but only within a five-year period. Some of the most advanced and promising technology has a longer gestation period and so does not yield profits within this five-year span to which earlier losses can be offset. In such cases there is a tax bias against the smaller firm as compared to the large firm. We believe this tax bias should be eliminated.

Recommendation 3.

We recommend that the threshold for application of the full corporate tax rate of 46% be raised for small businesses from $100,000 to $200,000 of annual net income; and for annual net income below $200,000 a progressive rate schedule beginning at 10% on the first $50,000, and increasing in 10% increments to $200,000 on each additional $50,000. In addition we recommend that the carry-forward provisions for start-up losses of small businesses be extended from five to ten years.

4. Qualified Stock Option Plan for Key Employees

Small, innovative companies depend upon stock incentives to attract and retain key employees because they cannot afford the high salaries paid by larger companies. Small companies tend to go through a growth cycle where, in the early stages, technical knowhow is the dominant skill required. In due course, commercial products or services are produced from this knowhow, but the number of customers is small. Later, as market opportunities expand and production grows, new requirements develop: how to manufacture and market products on a larger scale and how to organize and operate efficiently more complex activities. This stage requires managerial talents that are more likely to be found in larger firms than in smaller ones.

The problem, then, is how to attract experienced managers from larger companies. Prior to 1976 a widely used and successful incentive was an Incentive Stock Option, which allowed a key employee the following choice: If he chose not to be taxed in the year of grant on the then value of the stock, he could defer payment of tax from the exercise date of the option to the earlier of (1) the year of sale of the underlying stock or (2) ten years after the grant of the option. The Tax Reform Act of 1976 eliminated this option. Consequently, the current law unduly penalizes key employees of smaller companies who must sell optioned stock at the time of option exercise in order to pay the required tax, yet are unable to sell the stock obtained from exercising the option because of the limited or illiquid market for the stock.[11]

Recommendation 4.

We recommend restoration of the Qualified Stock Option Plan for Key Employees of small businesses.

5. Pension Fund Investment

Funds available for investment are increasingly under the control of institutional investors. Pension funds are a leading example, and their assets are now about $200 billion. The managers of such funds are subject to ERISA regulations, and a conservative interpretation of these regulations requires the fund managers to limit their equity investment to stocks of blue chip firms traded in large volumes on public exchanges. Amending ERISA regulations could open up a new source of funds for small, technically oriented firms. We find much merit in the recommendation of a 1976-77 Small Business Administration Task Force on Equity Finance that ERISA be amended in such a way as to increase the availability of capital to new, small, innovative firms without jeopardizing the safety of pension plan investments.[12]

Recommendation 5.

We recommend (1) that ERISA's prudent man standard be restated so that it is clearly applicable to the total portfolio of pension fund investments rather than individual investments, and (2) that pension fund managers explicitly be permitted to invest up to five percent of pension fund assets in small firms.

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[11] "A Program of Tax Revision Proposals to Enhance Capital Formation for Growth Businesses", National Venture Capital Association (NVCA), Washington, D.C. May 1, 1977, pp. 9-11. Also see pp. 34-36 of Technological Innovation: Its Environment and Management, U.S. Department of Commerce, Washington, D.C., 1967, sometimes referred to as the Charpie Report, for a discussion of the merits of liberalized stock options for small firms.

[12] Pages 14 and 15 of the cited report.

B. Reducing the Burden of Regulation

Small businesses, along with large businesses and non-profit institutions, have been burdened by the recent expansion of both federal and state regulations. Some of the recent regulations -- those for occupational safety and health and for environmental protection -- have impacted most businesses. Others -- those for food and drugs and auto safety — have applied to specific industries. We understand the social concerns that led to such regulations, and we are aware that both federal and state governments are reviewing whether current regulations are the most cost-effective way of dealing with these societal problems. For example, the Interstate Commerce Commission is relaxing its rules against shippers with their own trucking operations to seek for-hire traffic to eliminate otherwise empty back-hauls. We also recognize that the balancing of social gains and economic losses in assessing regulation is a complex task, ill-suited to a work group focussing primarily on the job-creating potentials of innovations by small, technically oriented businesses.

We note, however, that innovations — because they involve new products, services, and processes -- are likely to encounter considerable regulatory uncertainty.[13] Such uncertainty is particularly burdensome to small businesses because they lack the specialized staff of large businesses to cope with the regulatory maze. As a result the task of regulatory compliance is likely to fall upon the already over-committed line management of small businesses. Ultimately it reduces their competitiveness both in domestic and foreign markets. A partial solution lies in the creation of regulatory advisory services, themselves largely small profit-making businesses, which can develop computer data bases and an expertise for coping more effectively and efficiently with the complexity of government regulations than individual small businesses. Such a service can save the time of small business management and reduce the cost of compliance.

To encourage the formation of such firms as well as to recognize that even the services of advisory firms will only reduce, but not eliminate, the burden of regulatory compliance on small businesses, we consider it desirable that more than the deduction of the actual business expense be permitted for payment to regulatory advisory firms. Furthermore, as a matter of good government, we think the cost of regulatory compliance for small businesses should be highlighted in government decision making by a tax deduction that exceeds the actual expense.

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[13] George S. Lockwood, Founder and General Partner, Monterey Abalone Farms, "An Address to the Third Annual Colloquium or Research and Development Policy," American Association for the Advancement of Science, Washington, D.C., June 21, 1978.

Recommendation 6.

We recommend that small businesses be allowed to deduct twice their payments for regulatory advisory services related to compliance with federal, state, and local regulation.

C. Improving the Diffusion and Application of Technology

There exists in the United States an enormous volume of information and technology in the laboratories of universities, government, and business. Much of it lies dormant; little is transferred from one of these huge knowledge reservoirs to another, and even less from the reservoirs for transformation into new products and services that serve societal needs.[14] This is social waste: knowledge is one resource whose use by one individual does not preclude its use by another. And for individuals to rediscover what is already known is costly to both the individual and society. We lack well-defined programs to encourage the widespread use of existing technology. We propose such a program that focuses on both the public and private sectors and, as will be emphasized repeatedly, is vital to small business.

Diffusion of technology is particularly important because our nation's R&D efforts are so concentrated as to limit their application to only a few sectors of the economy. Besides important concentrations in federal laboratories and universities, the largest firms in our economy account for much of the organized industrial R&D, especially in the chemical, electronic, aeronautical, and pharmaceutical industries. Small business cannot afford self-sufficiency in technology, and our society can ill afford to let technology lie idle.

1. Technology Transfers from Federally-Sponsored R&D

Universities. The present level of research effort is approximately $5 billion -- nearly 70 percent of which is financed by the federal government.[15]

3.5

.70

The main reasons for the small amount of technology flowing into industry include lack of:

1. Well-defined programs and funds to implement technology transfer.
2. Incentives for faculty researchers to seek beneficial commercial applications for research results and to participate in technology transfer programs through personal linkages with users in industry.

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[14] Russel L. Ackoff and others, Designing a National Scientific and Technological Communication System, University of Pennsylvania Press, 1976, pp. 109-153.

[15] National Science Foundation, National Patterns of R&D Resources, National Science Foundation 77-310, pp. 10 and 2 .

3. Attention to needs of industry.
4. A positive government patent policy that stimulates private industry to commercialize inventions by transferring rights instead of retaining patent rights in most cases.[16]

Through the establishment of a well-defined technology transfer program, technology flow into small business can be substantially increased. One important element is commercially available, computer-based information storage and communication systems. Massive amounts of information can be stored in the computer memory and quickly recalled. By including two types of information in the data bases -- one consisting of descriptions of technologies in terms that show prospective buyers the kinds of problems the technologies will solve, and the other describing the problems that are to be solved -- interaction can be facilitated between providers and users of technology.

Specifically, when an idea for innovative technology occurs to a scientist during the course of a university research project, he lists it with a commercial, computer-based communications technology data base service. Conversely, those seeking innovations use the same service to obtain information about technologies that may satisfy their needs. This interaction not only greatly increases the chances that the idea will be used, but more importantly it makes innovation possible in response to a combination of market pull and technology push instead of just technology push. Experience teaches that the most successful and least costly innovations are those where there was early linkage between the idea and the needs of the marketplace, because the development could be properly guided through interaction between researchers and users.

Funding for technology transfer programs should be included as part of each government research project grant. The amount recommended is five percent of the total project funding, a small amount in relation to the expected benefit to society.

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[16] Remedies for this serious deficiency were not addressed by this Work Group because it is being addressed by the Committee on Intellectual Property and Information, which was established by the Federal Coordinating Council for Science, Engineering, and Technology. The Committee is in the midst of an effort to arrive at an agreed Carter Administration policy with respect to the allocation of rights in patentable inventions resulting from federally-supported work done by nongovernmental persons. The Committee is chaired by Dr. Jordan J. Baruch, the Assistant Secretary of Commerce for Science and Technology. Its efforts are separate from, but to be coordinated with, the Domestic Policy Review on Industrial Innovation.

Within the university there should be a small administrative organization to help market the ideas for innovative technology. Royalties paid by industry should be divided among the university (to help defray administrative costs), the scientists originating the ideas, and those who are key in helping to find industrial uses.

Another way to encourage closer relationships between small businesses and universities is through having small businesses sponsor the research at universities just as large firms do presently. Such sponsorship could be expanded by allowing small businesses a double deduction from its income taxes.

Government Laboratories. The situation in government laboratories is much like that in universities. A key statistic is that the federal government spends over $1 billion annually to disseminate results of federally-funded R&D.[17] Yet it is frequently impossible or extremely difficult for either government or industry to get these results. Reasons for this are essentially the same as those listed for universities.

The government agency with the largest R&D budget and least effectiveness in technology diffusion is the Department of Defense. The low level of success is due to almost total reliance on documents produced by research and development projects as the means of transfer. Other government agencies relying solely on documents have the same low level of results.

NASA, through its technology utilization program, has made a greater and more diverse effort since 1962 to transfer its research results into commercial use. In addition to the dissemination of publications, NASA has established industrial applications centers that assist industry in acquiring information on NASA technologies. While the NASA program falls far short of what might be achieved, more technology is moved into industry than would be the case without the program.

The largest and most successful federal effort to diffuse technology has been the Extension Service of the Department of Agriculture. USDA field agents working at the county level throughout the United States and drawing from the Department of Agriculture sponsored research results make direct contact with individual farmers.

A final observation to be made on government and university technology transfer activities is that in all cases the process begins after the research and development program has been completed. As noted earlier, however, the most successful industrial innovations are those where there was an early linkage between the idea and the marketplace, so that the development can be properly guided.

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[17] See "Federal Management of Scientific and Technical Information (STINFO)" prepared for the Special Subcommittee on the National Science Foundation of the Committee on Labor and Public Welfare, U.S. Senate, February 1976, pp. 9-10.

We believe that there must be a change from the traditional and ineffective practice by most agencies of merely disseminating information as a means of technology transfer to the more comprehensive approach that has been outlined. Funding for implementing the comprehensive approach for technology transfer should be included as part of every government project -- five percent of the total project funds -- the same as for university projects. For comparison purposes, it should be noted that the U.S. Department of Agriculture Extension Service budget of $270 million is about 50 percent as large as the department's R&D budget of $500 million, and the NASA technology utilization budget is $9 million, or about 0.3 percent of the NASA R&D budget.

Therefore, our proposals focus on facilitating the transfer of technology from the concentrations in government laboratories, universities, and industry to small businesses, where it can often be applied to realize a larger share of its economic potential.

Recommendation 7.

We recommend that each federal agency allocate five percent of its R&D funds for technology transfer. These funds should be used to establish well defined and organized programs of technology transfer in which there are incentives to individual researchers to contribute their time and skills to the identification of commercial applications. Such incentives should be related to the benefits realized from technology transfer.

2. Technology Transfers Within the Private Sector

Another large store of under-utilized technology exists in business firms. Most firms use only part of their stock of technology in their own commercial activities, but the remaining, unused technology may have commercial applications elsewhere in our economy. Even more importantly, firms utilize technology in one product that may have applications to other products. Interfirm transfer of technology is constrained, however, by concern for proprietary protection. Much of this concern is unwarranted because even in the few areas of significant technological breakthroughs in recent years, the new technology was diffused so rapidly that any initial business advantage was soon lost. Thus, in most industries, a number of companies are selling the same basic product, differentiation being achieved by design features to improve user application and appearance. Hence, much of the technology of one firm can be used by others with little competitive threat. Given the benefits to society from increased technology transfer and in recognition of the added costs of marketing technology, we recommend that both financial and social incentives be used to stimulate large companies to make their technology available to small companies.

Financial Incentives. The most frequent method of transfer is through a licensing arrangement. Another way in which technology transfer occurs is through the spin-off of small businesses by large firms. We believe that such spin-offs will be encouraged by the capital gains rollback for small business as set forth in our first recommendation.

A large firm can use technology unrelated to its main activity as the basis for establishing a small business in which it takes a minority position. Its capital gains would be taxed at the lower small business rate just as for any other investor.

Both licensing and spin-offs need to be supplemented by greater incentives for business firms, large and small, to participate more actively in technology transfers, and these can be provided by changes in the tax code. It must be recognized that such transfers are costly, and both buyers and sellers must be able to perceive at least some chance that their costs for transferring their unused technology will be covered. Further, if they perceive the possibility of greater profit, their interest in transfer will be correspondingly greater.

Social Incentives: Social incentive would be provided by the community in the form of a consensus that large companies should make their technologies more available as part of their obligation to society. This is a reasonable gesture by any company, because all technology is in part a product of our educational system and diffusion of knowledge from the technical efforts of other organizations.

Recommendation 8.

We recommend that private sector individual or corporate owners of technology be rewarded, through appropriate changes in the tax code, for selling, leasing, or licensing their technology to small business firms in the United States. In addition, we recommend the establishment of a voluntary national policy to encourage companies to make their technologies available for noncompetitive uses by others.

D. Some Redirection of R&D Spending Towards Small Businesses and the Needs of Small Family Farms and Food Processors

While there has been widespread comment on the decline of U.S. R&D expenditures as a percent of our Gross National Product, this same trend has in recent years also occurred in such countries as France, the United Kingdom, and West Germany; the notable exception being Japan (See Table 1). The United States remains by far the largest money spender on R&D even if defense and space spending is excluded (See Table 2).

The Work Group does not contend that R&D spending in the U.S., in total or in the amount devoted to civilian needs, is either demonstrably deficient or excessive. We do contend, however, that the amount spent by small firms is grossly inadequate. In 1975 only about three percent of our total national spending on R&D -- roughly $1 billion out of $35 billion -- was attributable to small firms. Funds from the federal government accounted for about two-thirds of this total — the balance from small businesses themselves.[18] While this small proportion has prevailed for some time, we consider it disturbingly low in view of the impressive record of innovation by small businesses.

Table 1. Distribution of National R&D Expenditures in Selected Industrially Advanced Countries as a Percentage of GNP, 1961, 1967, 1972, and 1975.

	1961	1967	1972	1975
United States	2.74	2.91	2.43	2.32
Canada	1.01	1.33	1.17	1.20^E
France	1.38	2.16	1.83	1.48
Japan	1.45^E	1.55	1.89	2.00^E
United Kingdom	2.69	2.69	2.39	2.25^E
West Germany	1.20^E	1.97	2.31	2.25

Source: National Science Foundation. Science Indicators 1976, p. 184, except estimates, as noted.

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[18] Scheirer, op. cit., p. 10.

Table 2. Estimated R&D Expenditures for Civil Purposes, 1975

(In billions of dollars)

	Canada	France	Japan	U.K.	West Germany	U.S.
1. GNP ($)	152	338	493	229	425	1516
2. % R&D	1.2	1.48	2.0	2.25	2.25	2.32
3. R&D ($)	1.8	5.0	9.86	5.15	10.6	35.2
4. % R&D in Space and National Defense	5.3	26.2	1.7	24.5	8.1	34.4
5. % R&D in Civilian Programs	94.7	73.8	98.3	75.5	91.9	65.6
6. R&D in Civilian Programs ($)	1.7	3.7	9.7	3.9	9.7	23.1

Sources:
Row 1. World Military and Social Expenditures 1978, pp. 21-2.
Row 2. Table 2.
Row 3. Product of Rows 1 and 2.
Row 4. National Science Foundation. Science Indicators 1976, pp. 186-7.
Row 5. 100% minus Row 4.
Row 6. Product of Rows 3 and 5.

As seen by the Work Group, one of our principal problems is how to increase R&D in small business firms. Since there have been important innovations created by cooperative work between large and small businesses, we would include such cooperation in our concern to increase the share of federal R&D funds to small business firms.

The Work Group is aware of a recommendation made some years ago (1972) by a Commission on Government Procurement to the effect that awarding a fixed percentage of government procurement to small business firms is not in the national interest. While this may be a valid constraint insofar as all government procurement is concerned, we do not believe it should apply to federal R&D funds. The outstanding track record of small business in technological innovation is ample justification for assuring that R&D activity in small business firms be stimulated through increasing its share of federal spending on R&D. We recognize that in certain basic research programs, the commercial sector may be an inappropriate institution for R&D. We believe, however, that applied research projects jointly involving small businesses and universities can be highly effective, and we recommend that a substantial number of these be sponsored by the government.

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The Work Group believes the National Science Foundation's program called "Small Business Innovation Applied to National Needs" has great potential for increasing technological innovation in the private sector and is worthy of emulation or even adoption by other federal agencies. By soliciting innovative proposals from small businesses, the program encourages the conversion of research on federal objectives to technological innovation in the private sector. This is done by requesting a contingent commitment for follow-on funding from a venture capital or large business source for continued development of the idea by the small firm if the research meets mutually agreed upon objectives.

Recommendation 9.

We recommend that each federal agency receiving R&D funds by appropriation from the Congress be required to allocate at least 10 percent of all such funds (excluding those for basic research) to small businesses and that this objective be achieved in annual 1% increments beginning in FY1980.

* * *

Small business firms that invest substantial amounts of their own funds in R&D are subject to risks of temporary reversals that jeopardize the stability of R&D spending, which is often less critical in the short run than other uses of funds. Yet by reducing or eliminating R&D, the small firm may endanger its future and the continued development of new products and services necessary for its longer term growth and survival. Collectively the problem inhibits the growth of small innovative firms as a national resource.

Stability in R&D activity in small firms would be encouraged if such firms were allowed to establish and replenish a Reserve for Research and Development in better profit years to be used to stabilize R&D in lower profit or loss years. The reserve would allow the firm to retain more earnings, which is important to firms seeking credit and investment.

The reserve would not be available to firms that could not generate earnings, but rather would assist those firms that have proved their competence by profitable operations. These are the firms that need encouragement to grow faster and to invest in R&D and to stabilize R&D programs.

The reserve could be accumulated to a level of $100,000 or 10 percent of the most recent year's sales, whichever is higher, up to a $1 million ceiling. Contributions to the reserve could only be made to the extent that actual R&D costs are incurred in any year and limited to the higher of $50,000 or 5 percent of sales for any single year. Any use of the reserve for R&D would be taxable just as contributions to it are tax deductible. If the firm became a large business through growth, or merger or acquisition by another small firm, the reserve could be used but not replenished. Acquisition by a large firm would result in the reserve becoming taxable income.

Recommendation 10.

We recommend that small business firms be allowed to establish and maintain a reserve for R&D for use in times of financial stress.

* * *

More must be done in addressing the steeply rising costs of food throughout our country. Obviously, many factors contribute to these increases, but one of the most important is the plateauing of productivity in major food crops. Per acre yields of wheat, sorghum, maize, soybeans, and potatoes have not increased since 1970. A significant part of the previous increases in productivity was accomplished with massive use of fossil fuels for cultivation, irrigation power, fertilizer, and pesticides. Costs of all of these are rising rapidly. Water shortages in a number of areas of the United States have occurred or are imminent. Productivity gains of the past have been associated with large-scale capital and fossil-fuel intensive agriculture. There is vast potential for improvement with innovations directed at developing less fossil-fuel and capital-intensive technologies, and technologies that make more efficient use of water and land. Research directed at creating these technologies would benefit both large and small farm operation

Small farms also are part of America's poverty problem. The conditions for many people, particularly blacks in rural areas in the South, are worse than in blighted urban areas.

The key element in improving the efficiency of small farms is technology. Capital, government policy, and other factors are important; but without technology appropriate to the task, capital and government policy cannot have the required effect.

Further substantiation of the potential of more emphasis on small-scale operations is provided by a brief review of some relevant current achievements, experiments, and emerging technologies

•••The Ball Company is marketing an energy-efficient canning operation that fits into 750 square feet of space.

•••Solar technologies are emerging that make small-scale grain drying and storage more efficient than present methods, and provide a lower cost source of power for irrigation.

•••The development of small-scale sprinkler irrigation systems is nearing completion. Indications are that these systems will provide a 15 percent savings in energy and as much as a 20 percent savings of water.

•••New, stronger, weather-resistant plastics are becoming available, which makes possible low-cost, small-scale hydroponic food growing and the manufacturing of small-scale methane gas generators.

•••Farm-size nitrogen fertilizer plants using air, water, and electricity from windmills are under development.

•••Multi-purpose, small scale farm tilling and harvesting implements are becoming available.

•••Farm management training for diversified small-scale operations are now readily available through computer-based education.

•••One of the most significant experiments under way is the model farm at Tuskegee Institute, where an income of $20,000 net per year is to be generated by a farm of 25 acres, of diversified high-value crops and other intensive agricultural technologies.

These examples demonstrate that new technologies can be developed to enhance significantly the productivity of small family farms and food processors with reduced requirements for capital and fossil fuels. With additional R&D effort, the viability of small farms over a wide range of conditions could be established. Furthermore, many of these kinds of small farm technologies are needed by developing countries and represent an important source of exports in the years ahead.

Recommendation 11.

We recommend that there be some redirection of federally supported agricultural research to the development of technology for improving the efficiency of small family farms and food processors and for making food production, transportation, and preservation less capital and fossil-fuel intensive.

E. Improving Export Performance

Much has been written about the fact that among industrially advanced countries, the United States is the least export minded. This can be discerned from the fact that less than eight percent of U.S. manufacturers export (perhaps 20,000 out of some 250,000 manufacturing companies). Moreover, the U.S. export base is highly concentrated: a recent survey conducted by Business International Corporation discovered that 123 firms accounted for 41 percent of U.S. exports of manufactured goods in 1976.[16]

There are several explanations for the low rate of participation of small firms in exporting activity. First, they lack the knowhow to find and penetrate export markets. Such knowhow can, of course, be bought or acquired through experience, but it is expensive. Second, profit margins in international markets have not, until recently, been sufficiently high to attract a large number of small firms. The currency devaluations earlier in this decade have shifted the terms of trade to such an extent that exporting could well become a highly profitable activity for many small firms.

For this development to occur to any important extent, two kinds of measures are needed. One is institutional: a new private sector organization should be created to enable small firms to reach export markets on a shared-cost basis. The second is financial: special tax incentives are required to encourage small firms to overcome the initial costs of entering export markets. Once threshold barriers are overcome, the profitability of exporting can be expected to sustain the growth of exports from small, technologically based firms. Such exports would strengthen our balance of payments while simultaneously providing for the growth of small firms through opening new markets.

With respect to new organizations, we consider the most promising to be Small Business Export Trade Corporations (SBETC) -- private corporations to provide marketing services to a group of small firms. An SBETC must serve at least three clients who are small business firms, and its primary activity must be export promotion for small business. To encourage their formation, these organizations need special tax incentives.

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[16] "Effects of U.S. Corporate Foreign Investment, 1970-76," Business International Corporation, May 1978.

With respect to individual small businesses, we consider that significant tax incentives are needed to encourage the incurring of the initial special costs of entry into export markets. These include sales literature, sample advertising, trade fair participation, special engineering and tooling, new equipment, reserves for bad debts, and so forth. The special tax incentives as described are believed to be consonant with U.S. commitments to the General Agreement on Tariffs and Trade (GATT). If necessary, the proposed upper limits could be further constrained so as to prohibit a net rebate of income taxes to the participating firms.

Recommendation 12.

We recommend that the creation of Small Business Export Trade Corporations be encouraged by a double deduction for these corporations of up to $100,000 of annual expenses associated with the exporting activities of each client, with a loss carry-forward of ten years. In addition, we recommend that small businesses be allowed a double deduction of special expenses of serving export markets up to $100,000 annually.

IV. CONCLUSION

More new jobs, especially skilled jobs; better solutions to our national problems of urban decay, pollution, steeply rising costs of food and housing, and health care; and increased competitiveness in international markets, all depend upon our ability to stimulate the rate of technological innovation in the United States. Small businesses can play a significant role in achieving this goal.

The recommendations contained in this report are directed at restoring the vigor and vitality of our small businesses, which traditionally have generated the larger share of the truly innovative breakthroughs in science, technology, and engineering. Ways have been identified to increase the supply of venture capital, without which new businesses cannot get established, much less flourish. Some redirection of government R&D spending is recommended to channel more funds into R&D effort that is most likely to benefit small businesses and small family farms.

Recommendations are made for not only increasing the supply of new technology, but also for stimulating the transfer of technology from federally funded R&D projects to the private sector and from large business firms to small ones. Concrete proposals are offered for expanding exports and for reducing the heavy costs of compliance with government regulations.

Our recommendations do not call for federal aid to small businesses and small farms. On the contrary, implementation of all of the recommendations of this report, or of any one of them, does not require any increase in budgetary support from the federal government.

In addition to our 12 recommendations, we urge the Department of Commerce to encourage the creation of "Community Cooperation Offices", which foster the start-up and growth of small businesses. A Community Cooperation Office is a nonprofit corporation supported by private contributions. The major segments of society are participants, including state and local governments, large and small business, academia, religious organizations, labor unions, and farm organizations.

The Community Cooperation Office assists small businesses in getting started by providing seed capital and in profitable growth by furnishing assistance in locating needed technology and consulting help. Cooperation Offices should be informally linked with the Department of Commerce so that their experiences and concerns can be most effectively shared. The Minnesota Cooperation Office for Small Business represents a possible prototype for consideration by other states.

Finally, we urge the Department of Commerce to undertake the education of the American public as to the importance of technological innovation in creating solutions to our major social problems, and to the vital role of small business firms in the innovation process.

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